OCTOBER

THE JOURNAL
OF THE
AMERICAN DENTAL ASSOCIATION
AND
THE DENTAL COSMOS

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The Journal of the American Dental Association and The Dental Cosmos Vol. XXV, No. 10. Published by the American Dental Association, 212 East Superior Street, Chicago, Ill. Yearly subscription $5.00. Entered as second-class matter, March 25, 1937, at the postoffice at Chicago, Ill., under the act of Aug. 24, 1912. Published monthly.

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THE JOURNAL *of the*
AMERICAN DENTAL ASSOCIATION*
and THE DENTAL COSMOS**

*Vol. 25, No. 10 OCTOBER 1938 **Vol. 80, No. 10

NON-SURGICAL TREATMENT OF PYORRHEA

By G. R. LUNDQUIST, M.S., D.D.S., Chicago, Ill.

IT is no longer necessary to elaborate on the fact that, with age, the soft tissues about the teeth usually change their position from the crown of the tooth to the root of the tooth; nor is it necessary to state that there is a general tendency with age for teeth to drift occlusally and often mesially when a full complement of teeth are present.

If these statements be true, the maintenance of the soft tissue attachments to the tooth in any one fixed position is out of the question, as is the wishful thinking associated with the possibility of reattaching the tissue in the region of the pocket in the original position of its attachment.

Our problem, then, resolves itself into a gingival crevice or pocket consisting of the detached soft tissue with its more or less intact epithelial cover, on the one hand, and, on the other, the root of the tooth with its more or less contaminated cementum. The pocket or crevice consisting of the hard tissue side or tooth should be considered from the point of view of so-called "traumatic occlusion"; whereas the soft tissue side should be analyzed with the aim of reducing the depth of the crevice by treatments which tend to cause the soft tissues to shrink or be obliterated to the level of their attachment to the tooth. The so-called "traumatic occlusion" phase will be considered first.

The writer has called attention to the fact that stress injuries should generally be considered as aseptic injuries, or the process of inflammation in its simplest form, which is complete only when a series of events that we call repair have occurred.[1]

This is best exemplified by a consideration of what occurs in the mouths of normal healthy persons and those suffering from metabolic disturbances.

Figure 1 illustrates a labiolingual section of an upper central incisor in functional occlusion. Here, the peridental membrane space is of fairly uniform width. The pressure regions (plus signs) and the traction regions (minus signs) are slightly wider than the intervening regions. Nevertheless, the restoration of bone seems to balance the resorption process; hence, we have a sound func-

From the Oral Pathology Department, Northwestern University Dental School.

Fig. 1.—Labiolingual section of upper central incisor in functional occlusion. Pressure regions, plus signs; traction regions, minus signs; bone, B; peridental membrane, P, and cementum, C.

Fig. 2.—Bicuspids and molars, showing adjustment of supporting tissues to variable functional demands; normal bony structures around lower bicuspids and molars; increased density of bone in apical region on distal side of both roots of lower second molar; cancellous bone around third molar.

tional tooth capable of withstanding occlusal, or incisal, and interproximal wear.

Figure 2 is a roentgenogram of a series of upper and lower teeth in an occlusion which indicates changes in the supporting structures accompanying variation in occlusal functional demands. Occlusal and interproximal wear attests to the vigorous use of all the teeth with the exception of the lower third molar.

Fig. 3.—Labiolingual section of upper central incisor representing early stage of change. The pressure regions are to the labial side near the crest of the process and to the lingual side near the apex. The traction regions are exceptionally well shown toward the labial aspect near the apex and toward the lingual near the crest of the process.

Physiologic resorption and recession of the gingival tissues, leaving no pockets, have occurred. The bone supporting the bicuspid teeth is of good structure as a

result of active use of these teeth, which were in normal occlusion. Particular attention is called to the fact that the distal half of the upper first molar makes contact with the mesial half of the occlusal surface of the lower second molar; and since the upper second molar is missing, the tendency is to tip the lower second molar mesially.

In the case of this normal healthy person (Fig. 2), the close proximal contact of the lower first and second molars probably retarded the second molar in its mesial movement. Nature's reaction to this force is expressed in an increased density of bone in the apical region on the distal side of both roots of the lower second molar. Hence, increasing the functional demand has tended to strengthen rather than to weaken the supporting structures. Since there is no functional need for dense bone around the lower third molar, which is not in occlusion, the adaptation to this results in development of cancellous bone. Here then, we have an excellent adjustment to variable functional demands. Normal bony structures accompany the normal functional demand. Increased density of bone is found associated with increased functional demand, and definitely cancellous bone occurs in the absence of functional demand.

The lesions involving the investing tissues in the regions of pressure and traction in persons lacking normal resistance are often characterized by uneven occlusal and irregular interproximal wear of the crown portions of the teeth or by loose teeth incapable of such adjustments.

Figure 3 represents an early stage of change, indicated by widening of the peridental membrane in the pressure and traction regions. In the pressure regions,

Fig. 4.—Typical illustration of chronic suppurative pericementitis (or "pyorrhea" so-called) calculus, C. Thin epithelial cover of detached soft tissue, TE^1; thicker epithelial cover of detached soft tissues, TE^2; epithelium, E; bone crest, A; round-cell infiltration, RI; food débris and calculus, F.

labiogingival and apicolingual, the peridental fibers are relaxed, with the result that the blood vessels, nerves and lymphatics take on a circular arrangement; whereas, in the traction regions, linguogingival and apicolabial, such vessels appear ovoid as a result of tension. Bone is being resorbed in the pressure regions, and some is being rebuilt in the traction regions. Noticeable also is the new bone being laid down in layers labially to the labial alveolar process to reinforce it against complete resorption and thus prevent a too rapid labial tipping of the tooth.

Such conditions may allow for more individual tooth movement. Attention is called to the fact that only teeth with sound pericemental structures can be worn off occlusally and proximally in the act of mastication, the leverage action on such teeth being thereby reduced. Hence, in those cases wherein more individual tooth movement is allowed, the intervals between the application of pressure and repose are so short that the pressure acts as though it were more or less continuous. This brings the movable tooth to a new position in occlusion. Overstress, under these conditions, may become effective as overstrain, which is a pathologic effect wrought by activity. Under such conditions, the case is not improved by exercise. Such a tooth actually becomes less capable of responding to a given demand, so that it may drift out of oc-

Fig. 5.—Case in patient 50 years of age. The gingival crest (GC) coincides with the bottom of the crevice or point of attachment to the tooth, BC. E, epithelium along cementum of root.

clusion and become stable, since rest is effective under such conditions. Again, such a tooth may be continuously injured as the teeth are occluded. In this case, to relieve the excessive occlusal stress may not be sufficient. In orthodontic experiments reported by Stuteville,[2] resorption of bone ceased, and bone was rebuilt on cessation of pressure coincident with the use of retainers. In both cases, destruction of certain pericemental structures occurred. It can be expected that the use of splints or fixed bridges to limit undue movement of the teeth may have a similarly beneficial effect in the mouth of an adult.

Changes occurring in the tissues associated with variable degrees of stress should be considered separately from those due to inflammatory processes associated with gingival injuries and the presence of pericemental pockets, which as a rule are infected.

Hence, it will be seen that the pathologic conditions arising as a result of the presence of a gingival crevice or pocket may in themselves be responsible for the changed position and looseness of the involved tooth and therefore must be dealt with separately.

Fig. 6.—Mesiodistal section between adjoining teeth. Calculus deposits, C; gingival connective tissues, CT; round-cell infiltration, RI; almost total lack of epithelial cover, E.

Returning then to the soft tissue side of the so-called "pyorrhea pocket," we note, for instance in Figure 4, that seldom, if ever, do we find an intact epithelial cover over the soft tissue, regardless of Nature's attempt to increase

the thickness of the crevicular epithelium. (Fig. 4.) This implies the possibility of a more or less continuous reinfection. Unfortunately, this is not the only factor in a more or less chronic condition. The detached soft tissue as it is buffeted about in the act of mastication is also subject to a persistent although slight trauma, for the reason that what remains of the elastic connective tissue no longer resists deformation and therefore it does not recover its original shape and size. If it were not for this fact, healing might occur even in the presence of infection; for instance, one bites one's tongue, and the tongue heals as a result of the trauma being discontinued.

It is obvious that a gingival crevice consists of the cementum of the tooth root covered more or less with calculus on one side and the soft tissue with its incomplete epithelial cover on the other. This results in a pocket filled with desquamated epithelium, débris and pathogenic micro-organisms. These facts taken together readily explain the small round-cell infiltration of the adjoining connective tissue as a reaction to the ingress of micro-organisms or their toxic products. (Fig. 4.)

It seems strange that the many suggested general causes usually fail to produce the particular localized lesion just described. No one has any doubt that a constitutional debility of the patient would affect the progress of these gingival pathologic involvements. Why they should be considered the most important etiologic factors in so-called pyorrhea is difficult to determine. It is known, of course, that a lack of vitamin C causes scurvy and that one symptom

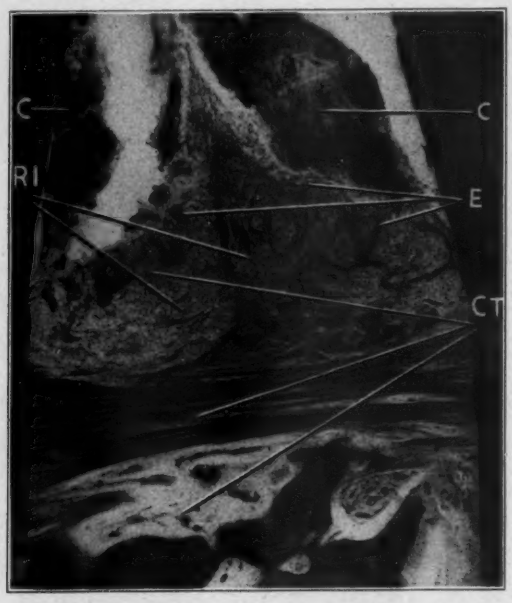

Fig. 7.—Mesiodistal section between adjoining teeth. Calculus deposits, C; gingival connective tissue, CT; transseptal fibers intact (less round-cell infiltration than in Figure 6); round-cell infiltration, RI. Cases shown in Figures 6 and 7 will yield readily to proper cleansing operations.

of this disease is gingivitis. Gingivitis can also be produced, however, by the ingestion of metallic poisons such as bismuth and mercury. These conditions are specific types of gingivitis which yield, in the one case, to elimination of the metallic poisons and, in the other, to the addition of vitamin C, and they do not, therefore, explain the low-grade slowly progressive gingival injuries, which, even in the absence of the above-described conditions, develop into the so-called pyorrhea pocket. Peculiar also is the statement that a disordered function of the parathyroids selects the particular bit of connective tissue underlying the intact epithelial cover of the soft tissue side of the pocket in which to develop a pathologic lesion, when elsewhere in the body exist masses of exactly similar tissue not so involved. Again, the crevice itself is the best explanation of the round-cell infiltration. This is just as true when we consider the fact that a lack of vitamin A is supposed to involve the crevicular epithelium as when the epithelial cover of tissue elsewhere over the body is not so involved. One cannot fail to realize, then, the prime importance of the fact that the crevice or pocket exists.

Fig. 8.—Mesiodistal section between upper first and second bicuspid; biopsy ten days after prophylaxis. New intact epithelial cover, IE; connective tissue nearly free of round-cell infiltration, CT.

Since a pyorrhea pocket as defined in

this paper presents two surfaces, we have the choice of eliminating the hard tissue side of the pocket, namely, the tooth, as has been the vogue up to the present time, or eliminating the soft tissue side of the pocket to its level of attachment.

It is ridiculous to require of a patient that he clean region c, Figure 4, or the pocket area, when the inflamed, swollen, detached gum margin prevents access to the region. Such an area can be kept clean only by being made accessible, which can readily be done by eliminating the soft tissue side of the pocket.

The object of the treatment is to transfer the crest of the gingivae to the point of attached soft tissue so that the epithelium joins the tooth at the natural angle for deflecting food particles without injury to the gingivae. (Fig. 5.)

When tissues have been detached from the tooth root with age, under normal masticatory conditions, a process known as physiologic resorption of bone and recession of the overlying soft tissue takes place. In these cases, the gingivae have often receded, perhaps a little more rapidly than the bottom of the pocket, and the pocket has been reduced to a zero or near zero crevice. (Fig. 5.) Thus, the soft tissue is attached to and meets the tooth at an angle that is easily cleaned and is nearly self-cleansing. With suitable implements, the actual point of attachment to the tooth can be rubbed and stimulated every day to maintain its normal deflecting contour and health.

Similarly, a zero or near zero crevice with a suitable deflecting contour can be obtained in many adult mouths with

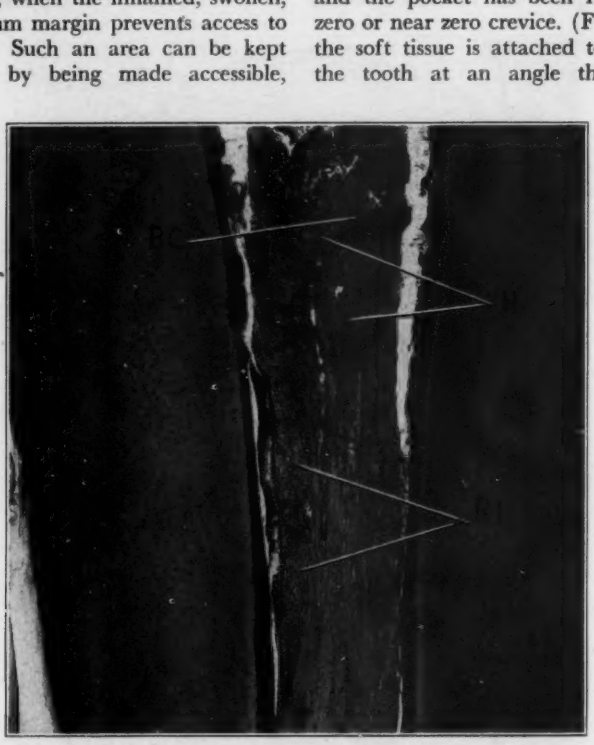

Fig. 9.—Mesiodistal section between adjoining teeth, showing case demonstrating immediate effects of electrocoagulation. Hemorrhagic effect in tissue, H; blood coagulation, BC; round-cell infiltration, RI.

shallow pockets from 1 to 2 and occasionally 3 mm. in depth by the process known as scaling or removal of deposits on the surface of the tooth root. Figures 6 and 7 illustrate septal gingivae of two cases of adjoining teeth on which deposits of calculus have occurred. The tissue is practically devoid of an epithelial cover, which allows for the inflammatory reactions previously mentioned. In such cases, the simple procedure of removing the deposits from the tooth root results in a result. As long as the epithelium is intact, and the tone of the underlying connective tissue base is maintained, reinfection does not occur and the chronic characteristics of the disease process are terminated. Control is obtained.

If these pockets are somewhat deeper after gross scaling of all the teeth, wisps of cotton that have been wound around a peridental membrane explorer and then dipped in an 8 per cent solution of zinc chloride are packed in each labial, buc-

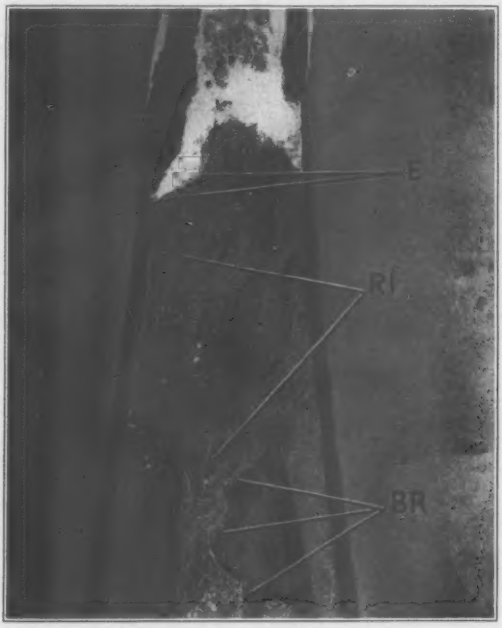

Fig. 10.—Mesiodistal section showing effects of electrocoagulation in case of sixty hours' duration; gingival tissues necrosed and sloughed away leaving zero crevice. Incomplete epithelial cover, E; tremendous round-cell infiltration, RI; active bone resorption, BR.

suitable control. The presence of a new epithelial cover over the gingiva (Fig. 8) precludes reinfection of the underlying connective tissue. Nature, it seems, is quite capable of combating one and often many infections; hence, as the inflammation subsides, the gingivae shrink and a zero or nearly zero crevice is the

cal and lingual crevice. Similar dressings are packed against the septal gingivae, the contact point being used as a wedge, so that the gingival crests are definitely compressed.

This procedure, on removal of the zinc chloride packs, helps to uncover other deposits farther down the root which had

been previously overlooked. When the foregoing requirements have been satisfied, an intact epithelial cover over the soft tissue develops and interdental stimulation will help to cause shrinkage of the tissue rather than absorption of the products of inflammation, and a possible reinoculation of the tissues. Such a procedure eliminates a considerable number of pockets 3 mm. deep.

tists who do not turn readily to surgery, simple as the operation is, and who would not therefore completely eliminate the pocket. For these men, the electrocoagulation approach is available under properly selected conditions.

Electrocoagulation to eliminate gingival crevices or pockets should not be attempted until the deposits have been removed from the root surfaces of teeth,

Fig. 11.—Mesiodistal section showing effects of electrocoagulation in case of one week's duration. Zero crevice, increased thickness of epithelium, E, as compared to Figure 10; spirited round-cell infiltration, RI; active bone resorption, BR.

ELECTROCOAGULATION

If the pocket depth is greater, one may resort to electrocoagulation of the tissues or to surgical measures to eliminate the soft tissue side of the pocket. There is no more certain way to eliminate the soft tissue side of a pocket than a clean incision with a sharp scalpel. There are, however, a considerable number of den-

so that the inflammatory reaction to such an irritant has time to clear, which usually occurs in from four to seven days. If this procedure is followed, anesthesia is more satisfactory, and healing is more regular and certainly takes place with less pain.

As a result, cases which in the active inflammatory state seemed to call for

electrocoagulation as a possible procedure of choice will not require such treatment. A diagnosis to determine indications for or against the electrocoagulation method of pocket elimination should not be made until the foregoing requirements have been satisfied.

When tissues are coagulated in the pocket region, those particular bits of tissue become necrotic. This implies a fixation of tissue the violence of which is just short of that produced by actual cautery. (Fig. 9.) The coagulated tissue sloughs off in from about forty-eight to sixty hours. (Fig. 10.) By the end of a week, a new epithelial cover is developed. (Fig. 11.) However, the underlying connective tissue participates actively in the process. It is characterized by a spirited round-cell infiltration. (Fig. 11.) In the next few weeks, there is active bone resorption, which is replaced progressively in from three to five weeks. (Figs. 12 and 13.) Certainly it may be said that the tissues have been reactivated. Seemingly, the object of all treatments is reactivation of the tissues. Especially is this true in these low-grade chronic condi-

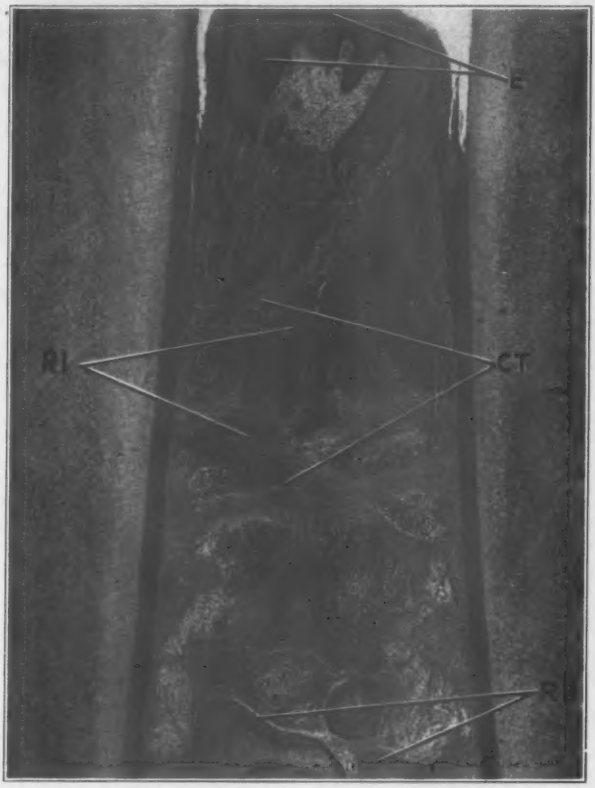

Fig. 12.—Mesiodistal section showing effects of electrocoagulation in case of five weeks' duration. Thick epithelial cover, E; less round-cell infiltration, CT, RI; regeneration of bone, RB.

tions. At the end of four or five weeks, if the pocket has not been entirely eliminated, the process may be repeated. Thereafter, interdental stimulators and proper brushing should be employed to maintain the zero or near zero crevice with a natural contour for deflecting food particles, to avoid further injury. (Fig. 5.)

Fig. 13.—Case shown in Figure 12. RB, regeneration of bone. (High power photomicrograph.)

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PHYSIOLOGIC VS. PATHOLOGIC OCCLUSION

By David W. McLean, D.D.S., Los Angeles, Calif.

OCCLUSION, in its broader meaning, may be termed the closure maintained by the mandibular and maxillary dentures, not only in the static centric relationship, but throughout the full range of the mandibular movements incident to masticatory function.

If the positions, dimensions and occlusal surfaces of the teeth are such that during functional jaw movements, mandibular cusp blades contact maxillary cusp blades throughout the dentures, those dentures can perform their masticatory function most effectively, and their occlusion may be termed a "physiologic occlusion." Commonly such dentures are said to have "bilateral balance" or "balanced occlusion."

If, however, the occlusion of the dentures is incomplete in some portions of the functional jaw movements, owing to the interference of a few misplaced or malformed teeth, there are two results: Not only is masticatory function proportionately less effective, but also, in time, the interfering teeth suffer from the excessive force exerted on them by the jaw and its musculature, and develop periodontal pathosis. Such an occlusion may, therefore, be termed a pathologic occlusion.

An occlusion which delivers jaw force to one tooth may occasionally produce in the periodontal tissues acute inflammatory reactions which might correctly fall under the definition of trauma. The more common reaction is a slow, insidious one: first, overstimulation of the periodontium, resulting in gradual gingival and possibly osseous hypertrophy, but, later, a gradual breaking down of the periodontal circulation, tone and resistance to bacterial invasion, with the more complex picture of chronic periodontal pathosis as an end-result. While periodontal bone resorption may be considered a result of excessive occlusal force, the reaction covers too long a period to permit of its classification as trauma, a wound resulting from an injury. Furthermore, the syndrome of periodontosis is complex: occlusal force usually has nutritional, metabolic or other systemic derangements on the one hand, and bacterial invasion on the other, as synergistic or co-working etiologic factors. "Pathologic occlusion," a term suggested by Endelman, is, therefore, preferable to "traumatic occlusion."

It is true that many persons have pathologic occlusion in which a few teeth are subjected to jaw force, with no marked evidence of periodontal pathosis. These patients have a high rating in the two other etiologic factors, namely, the systemic group, in which mineral distribution and metabolism and general physical health are factors; and the oral group, in which gingival irritants (inlay margins, calculus, interproximal "food pockets," etc.), faulty mouth hygiene and bacteria are factors. Usually, even in these cases, close examination will reveal localized gingival hypertrophy or recession around the teeth subjected to excessive force, showing that the pathologic processes are under way, but are slowed up by the resistance of the rugged periodontal bone.

It is equally true that some patients

Read at a meeting of the Academy of Restorative Dentistry, Atlantic City, N. J., July 10, 1937.

who have a high rating as regards the occlusal etiologic factor (have a "physiologic occlusion") are still subject to periodontal pathosis because they are deficient in one or both of the two other etiologic groups. The roentgenograms of these cases show a general bone resorption throughout the mouth. The bone maintains a horizontal level, which periodontists speak of as "horizontal atrophy" or "horizontal resorption."

When, however, the general bone level, as shown by roentgenograms (Fig. 1) suffers those occasional breaks to a low level or to pocket resorption, which periodontists have termed "vertical atrophy" or "vertical resorption," the clinician must consider, in addition to the systemic and oral factors, that of excessive occlusal force. Almost invariably, competent search will show that excessive force is being exerted on the involved tooth at some point in the mandibular masticatory movements.

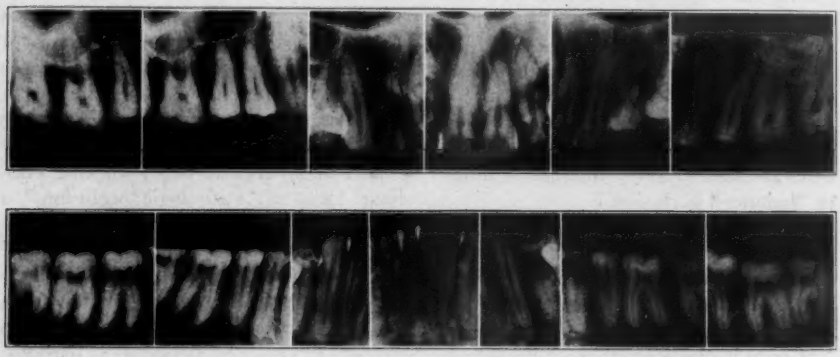

Fig. 1.—Roentgenograms of a patient 22 years of age. The dystrophic bone shown in the pictures indicates inadequate mineral metabolism. There is a clinical history of low grade chronic Vincent's infection. The bone level shows sudden breaks to vertical pocket resorption about the teeth which have suffered from the excessive force of pathologic occlusion.

The clinician cannot hope to make progress against insidious, but persistent chronic periodontal pathosis, when treatment is directed against only one or two of its three etiologic factor groups. It is just as illogical to direct treatment against the oral and systemic factors and ignore occlusal force as it would be to correct the occlusion without subgingival curettage and attention to the dietetic and systemic factors.

Since efficient masticatory function, and therefore physiologic occlusion, are conceded to be important to general health, and since pathologic occlusion plays a constant part in a universally prevalent oral disease which adversely affects general health, through the bacteria and toxins present, and which, in time, destroys the dentures, any possible study and research which will establish once and for all what constitutes normal or physiologic occlusion, and which will correlate the various types of malocclusion, whether developmental or acquired, with the pathoses which they help to produce, would seem in order.

As an introduction to an analysis of occlusion, two things are necessary: (1) to review the growth and present status of our concept of physiologic occlusion and (2) to review the manner in which the human being has acquired his occlusion; for a visualization of its development will contribute to a better understanding of its nature and derangements.

GROWTH OF THE CONCEPT OF PHYSIOLOGIC OCCLUSION

The study of occlusion is comparatively recent. In 1874, Salter, in his "Oral Physiology and Surgery," wrote: "The prime function of the teeth is mastication, which is so obvious that it need not be considered further." And, true to his belief, Salter dropped the subject right there. For several succeeding generations, dentists continued to feel that a full complement of teeth, in satisfactory centric or static intercuspation, guaranteed efficient masticatory function.

The prosthodontist, however, began to note that if the patient's jaw "rode" a cuspid tooth during masticatory movements, his dentures became dislodged. Groping his way beyond static occlusion,

Fig. 2.—Powerful gnathodynamic system of wolverine, shown with vertical cutting molars in readiness for shearing. These teeth are thick buccolingually. The sharp notched blade of the upper tooth lies along the lingual edge, that of the lower tooth along the buccal edge. The occlusal surfaces slope away from the blades. The large attachment areas for the muscles that close and lock the jaws and the temporomandibular joints placed directly posterior to the dentures are to be noted.

the prosthetist began to study dynamic occlusion, with two results: he began to develop articulators having some sort of lateral movement, to replace the barn door hinge and the plain-line articulator; and he began to talk about "three point contact" between the dentures. In addition to contacts on the working side, where the bolus was undergoing mastication, he wanted an incisal contact and at least one contact of an upper lingual and lower buccal cusp on the opposite, or inactive, side of the mouth, to balance the dentures. This contact was called a "balancing contact," and as prosthetic skill and knowledge of jaw movements grew, the prosthetist began to want a whole row of balancing contacts; for he realized that inequitable distribution of chewing force led to resorption of the ridges which carried artificial dentures.

In due course, the periodontist began to realize that jaw force falling on one or a few teeth destroyed the bone which supported the natural dentures; and he

Fig. 3.—Mandibular condyle heads of wolverine. These are shaped like slightly convex rolling pins and slide horizontally but not forward or downward. The most powerful victim clamped in these jaws could not break or dislocate the mandible. The joint is capable of hinge and Bennett movements only. As the jaw swings upward, the cuspids engage and guide it so that the molar blades will be closely approximated for shearing. The cusp blades shear vertically and the joints operate vertically. (Specimen presented to author by J. E. Snider, White Horse, Alaska.)

too began to study dynamic occlusion. Soon the urge to *prevent* periodontal pathosis led to a realization that physiologic or non-pathologic occlusion must be a basic consideration in all operative and restorative procedures.

Such a realization brought forth a demand for an answer to the question: What *is* normal or physiologic occlusion? One school of thought argued for "bilateral occlusion," for cusp contacts on both sides of the dentures during all functional movements of the mandible. A second group argued that human beings are unilateral chewers and therefore do not require bilateral or balancing cusp contacts; that the jaw works in a "unilateral balance" of muscular control. A motion picture study was made showing herbivorous animals chewing unilaterally, as an argument for "unilateral balance" of human jaws and dentures.

"Examine 100 individuals," argued the

Fig. 4.—Broad, flat posterior teeth of herbivorous animal, exemplified in the horse, with blades designed for horizontal cutting. The temporomandibular fossae (left, center) are open in type and comparatively shallow, permitting free lateral movement of the mandible.

devotees of this school, "and how many will you find with a bilaterally balanced occlusion?"

And then came the cynical but clever epigram, "Enter bolus, exit balance," which seemed to clinch the argument once and for all.

As a matter of fact, we have four denture strokes produced by four appropriate masticatory jaw movements:

1. The incising stroke, in which the mandibular denture is carried forward until the upper and lower incisors are "edge to edge." The dentures are then forcibly approximated through the food mass, and the lower denture is moved back to its centric position, the lower incisors cutting against the upper ones during the movement.

2. The crushing stroke, in which the mandibular denture is carried to a "lateral" position and brought forcibly into contact with the upper one, crushing the bolus under a unilateral balance of muscular control, which permits gradual application of heavy force without injury to teeth or periodontium. It is during this crushing stroke that balance "exits" as do *all* cusp contacts, until the dentures make contact through the crushed or perforated bolus, when cusp contacts become a factor of mastication.

Fig. 5.—Prehensile cuspids and, somewhat modified, vertical molar blades of carnivora, retained by omnivorous type, exemplified by gorilla. In this picture, the cuspids and lower first premolar show strikingly the shearing action of tooth blades. The upper and lower cuspids first make contact near their points. As the jaw closes, the distal edge of the lower cuspid glides along the mesial edge of the upper one. The moving contact point between the two blades shears just as does the moving contact point of a closing pair of scissors. As the jaw closes and approaches centric relationship, the blades of the buccal cusps of the posterior teeth will engage. As the chewing stroke continues, the occlusal transverse ridges of the buccal cusps will glide across each other and the moving contact points will shear horizontally.

3. The shearing stroke, which begins at the close of the crushing stroke. The mandibular denture is moved from the lateral position toward the centric one, each contacting upper and lower cusp ridge constituting a pair of shears. The dentures are thus visualized as a multi-bladed shearing machine.

Here an important question arises: Does the mandibular shearing stroke end at centric position, and, if not, where does it terminate?

4. The triturating stroke. When resistant fibrous boli are being sheared, the jaw often pauses midway in its shearing stroke to rub the dentures back and forth laterally in several short strokes, then resuming the full shearing stroke, much as the laundress scrubs a garment for a moment in the center of a washboard, then resumes full length strokes.

Fig. 6.—Teeth of gorilla in position for continuation of chewing stroke. As the centric position is passed, the lingual (so-called balancing) cusps engage and their ridges continue the shearing action. Thus, the cutting stroke extends from the jaw position in which the upper and lower buccal cusps are edge-to-edge, across through centric relation to the point where the upper lingual and lower buccal cusps are peak-to-peak, or in the so-called balancing relationship. On the opposite side of the arch, at the end of the chewing stroke, the buccal cusps are in typical "working" relationship although the major portion of the work is not being done there. (Specimen in the Museum of the College of Dentistry, University of Southern California.)

Answering the third argument against bilateral balance of the dentures, let us examine 100 individuals. Some will be found without *any* balancing contacts between upper lingual and lower buccal cusps on the inactive side (that is, on the left side of the denture when the jaw is in the right crushing, or right lateral, position, and vice versa). A few will be found with a full complement of balancing contacts between all molar and bicuspid teeth. By far the greatest number will be found to have one, two, three or four balancing contacts.

Fig. 7.—Harmony of tooth position and tooth form with movement center in temporomandibular joint, resulting in efficient bilateral function. If a pivoting center is chosen in the right condyle head of the gorilla mandible, arcs drawn from it pass through the buccal cusps and intercuspal grooves on the "working" side and along the grooves between the buccal and distobuccal cusps on the "balancing" side.

This finding gives us pause, for it looks as though Nature might be trying to accomplish something and perhaps not succeeding. And that impels us to ask: "What is Nature trying to accomplish?

How do we get our masticating apparatus?" We get it first by heredity—the heritage of evolution; and, secondly, by means of our own development as individuals.

It is said that the initial plan or design of the individual, and the initial growth urge or tempo which determines the individual's size, are laid down during the first two or three weeks of intra-uterine life. This is the hereditary or phylogenic factor. Then both the plan and the growth tempo may be changed by environmental influences, such as abnormal pressures or prenatal diet or medication. This is the modern, individual, or ontogenetic, factor of our development.

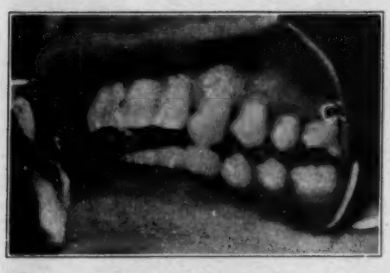

Fig. 8.—Case in which, in left lateral jaw position, force falls exclusively on cuspid, which has excessive mesial inclination. The ring of hypertrophied gingival tissue is to be noted.

PHYLOGENETIC DEVELOPMENT OF THE MASTICATORY APPARATUS

Gregory, in his "Origin and Evolution of the Human Dentition," states that the prime objective of all living things is to obtain solar energy. Plants obtain it direct and, by means of their chlorophyl, build it up into their own substance. Animals prey upon the plants and upon each other, to gain solar energy already synthesized, ready for their use.

Reasoning from this, it is not difficult to visualize some of the earliest monocells developing better collecting and synthesizing ability toward solar energy than others, and preying upon their more backward fellows, developing ameboid motion and founding the animal kingdom, while the others remained as the progenitors of the vegetable kingdom.

From the primitive ameba, the picture shifts to a small aquatic animal called the lobelia, a simple sac-like creature, with digestive cells in the interior lining of the sac. Then, in prepaleozoic times, a small sluggish fish appeared, with a slit opening into a mouth cavity which connected with an alimentary tract. This animal had no jaws nor teeth, but obtained nourishment from the mud and from small defenseless animals.

These fish were propelled slowly through the water by rhythmic undulations of the muscles along the sides of their bodies. The constant push of these muscles developed a median raphe or chord through the center of the animal's body, and these fish are known as the chordates; continued stimulus led to calcification of the chord, and the vertebrates had their beginning.

Thus, it is seen that the stimulus of effort to perform new or more complex functions developed or modified structure and in time changed the very nature of the animal. Function developed structure; and structure exists only for the performance of function.

Later, as these Silurian and Devonian fish began to attack larger prey, their lips became armed with hard derm plates, and still further stimulus of effort led to the formation of jagged sawlike edges along the lips of these derm plates. Then small islands of the hard material formed along the edges of the lips and inside the mouth. These are known as dermal denticles, and in time they developed a turned-in base, which helped to keep them from tearing loose during conflict.

In time, cartilaginous jaws appeared, in series with the gill arches. Styloid teeth appeared and, by the time the mammals had evolved, these teeth were

set in sockets in jaws which had become calcified. Both jaws consisted of numerous small bones, some of which increased in size, while others were gradually eliminated. The mandibular assembly had no ramus and was suspended in muscles.

Gradually, the mandible was reduced to two bones which united early in life; rami developed, condylar processes and condyle heads appeared; contact was made with the squamosal bones of the cranium, and a portion of muscle tissue remained between the bony surfaces, differentiated into the interarticular bursa; and so the temporomandibular joints were evolved.

While the jaws and their joints were developing into the three present types, the carnivorous, herbivorous and omnivorous, the teeth themselves underwent changes of form, induced in some inexplicable way by changes in the manner of their use.

In later modified forms, the styloid posterior teeth of early fish developed a small mesial and a distal tubercle at the base of the stylus. These tubercles increased in size and the large central stylus or cone was reduced, until a triconodont form similar to modern carnivorous premolars was evolved.

In some forms, one of these smaller tubercles began to migrate in a lingual direction, until the three cones or tubercles were staggered, and the tritubercular tooth had evolved. Other

A

B

Fig. 9.—A, resorption on mesial surface of cuspid shown in Figure 8, and on lingual surface of first bicuspid, which was in complete buccoversion. B, bone resorption along mesial surface of root from jaw force exerted exclusively on mesially inclined upper cuspid. (Opposite side of same mouth.)

animal forms had many tubercles, and have been designated multitubercular teeth.

Although in some forms this tubercle migration is quite evident, Osborne and Gregory both believed that triconodont, tritubercular and multitubercular teeth undoubtedly developed synchronously, also. At any rate, these types are considered the precursors of modern carnivorous, herbivorous and omnivorous posterior teeth. Gregory states that it was the ability of the mammalia to develop complex tooth forms and complex jaw movements that made them superior in conquest and ability to adapt themselves to changing conditions and enabled them to dominate the world.

Thus in intra-uterine life, heredity

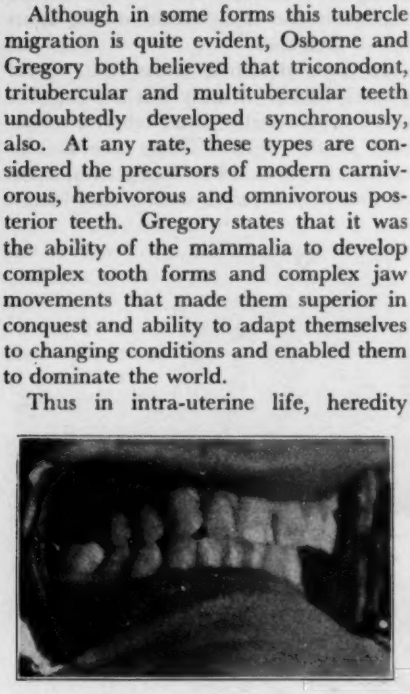

Fig. 10.—Case shown in Figure 8, after interfering cuspids have been reduced and bilateral balance has been in large measure attained by selective spot-grinding. Full correction could not be obtained in protrusive relationship because of the excessive amount of vertical overbite of the anterior teeth.

determines the design of three interdependent anatomic structures: (1) the temporomandibular joints; (2) the jaws, including the arrangement and positions of the teeth, and (3) the teeth themselves.

These three structures have been developed in unison, throughout the ages, to work harmoniously together to perform the complex and vitally important function of mastication.

In some of the modern species of gorillas, this coordination is clearly shown. The human family, however, are subject to the environmental vicissitudes of modern diet and life habits.

ONTOGENY OF THE MASTICATORY APPARATUS

By the time the child is born, the deciduous teeth are nearing complete development and the occlusal surfaces of the permanent first molars are being laid down. Cusp position, height and angulation are already predetermined. Six years later, if Nature's hereditary plan is not thwarted, the first permanent molars will erupt, find the occlusal level and meet their opponents, and cusp of one will fit into sulcus of the other. Moreover, when the jaw moves in mastication, the cusp ridges will shear harmoniously.

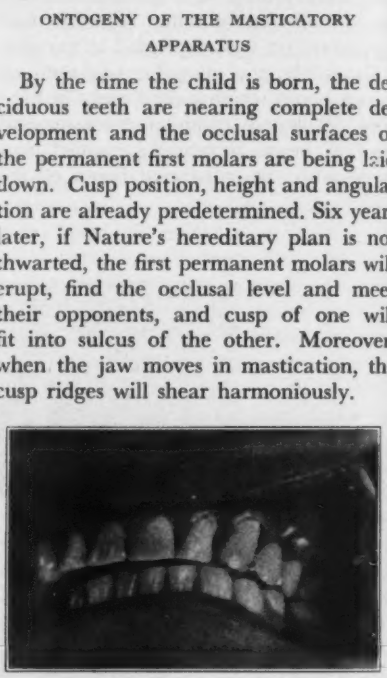

Fig. 11.—Another view of case shown in Figure 10.

Many things, however, may happen to prevent the perfect fruition of Nature's plan. Prenatal diet may have been deficient in the elements necessary for the development of hard, normally dimensioned jaws and teeth. The vitamin catalyzers may have been lacking, or endocrine function may not have been adequate, so that absorption, distribution and synthesization of the mineral elements may have been deficient.

During childhood, the jaws grow downward and forward, guided by a balance of pressure between the lips and cheeks on the outside and the tongue on the inside. Mouth breathing may un-

balance these pressures, and jaw malformation, with accompanying malocclusion, may result. Thumb-sucking and similar habits may unbalance the natural pressures or exert some unnatural pressure, producing malocclusion which will interfere with proper cuspation during mastication.

The commonest deranging pressures are those of the weight of the head when the child sleeps on his face or leans face or chin on hand.[1] These pressures cause what is perhaps the commonest malocclusion, and probably the most serious from a functional standpoint, characterized by intruded posterior teeth and long cuspid and incisor teeth; in other words, an excessive vertical overbite of anterior teeth. In these cases, the dentures are prevented from making bilateral or "balancing" cusp contacts, because the jaw "rides" the long cuspids and anterior teeth. The anteroposterior occlusal curve (of Spee) is broken, or has too great curvature or pitch to permit tooth form (cusp height and angulation) to function in harmony with the joint movements.

Fig. 12.—Typical "centric interference." The lower cuspid strikes the upper first bicuspid. The jaw rides these inclined planes to centric closure, exerting mesial pressure on the lower tooth and distal pressure on the upper.

Fig. 13.—Case shown in Figure 12, with jaws fully closed.

MOTION PICTURE ANALYSIS

The motion picture analysis, made in the Department of Gnathodynamics at the University of Southern California, shows first the gizzard of a chicken. The chicken has two horny bills devoid of teeth, with which to pick up grain and seeds having hard cellulose coverings. With its food, the chicken eats sharp-edged gravel and, on swallowing, both food and gravel pass into this muscular pouch. The gizzard, which is cut open, is seen to have a corrugated interior surface like that of a washboard. Food and gravel are churned together in this pouch until the seed husks are broken and the food ground up and laid open to the action of digestive ferments.

Even in the chicken, it is seen that several anatomic parts, of widely different nature, unite in function to masticate food. Incidentally, a chicken deprived of proper gravel soon gets "out of condition" and falls easy prey to contagious disease. If gravel is restored to it in time, masticatory function is renewed and health returns to the animal.

Next is shown the skull of the carnivorous wolverine. (Figs. 2-3.) The long prehensile cuspids shear vertically and the molars have sharp-cutting blades which shear vertically. The animal shears off chunks of meat and swallows them whole. The temporomandibular joints are simple hinges, operating vertically with a slight Bennett movement or lateral side shift to permit the blades of maxillary and mandibular molars to be brought forcefully into shearing contact. Here we have vertical shearing, vertical

cusp blades and a vertically operating hinge joint the condyle head of which is shaped like a rolling pin and must be slid sideways into or out of the cylindrical mandibular fossa which locks it to the skull.

Next is seen a herbivorous skull. (Fig. 4.) The maxillary denture is half again as wide as the mandibular one, and it is at once evident that no bilateral contacts were intended here. The molars have several chisel-edged cutting blades, running anteroposteriorly, in series, across the flat occlusal surfaces. The tooth blades cut during lateral chewing movements of the jaw, and the flat wide open temporomandibular joints are designed for lateral movement. The whole masticatory assembly is designed for the maceration of grass and leaves.

Next is seen the skull of the omnivorous gorilla, combining carnivorous and herbivorous features. (Fig. 5.) The cuspid teeth are carnivorous in type, as are the steep buccal cusps and deep buccal notches of the molars. The temporomandibular joints are capable of vertical hinge movement, during which these carnivorous factors function, and also of lateral movements, during which a finely coordinated row of balancing cusps can operate laterally after the manner of herbivorous mechanisms. (Fig. 6.)

Next, one point of a pair of dividers is placed on a center in the left mandibular fossa of the gorilla skull, and its other point is made to trace the buccal cusp ridges and intercuspal grooves on the left side of the denture. With the divider point on the same point in the left mandibular fossa, the other divider point is made to trace the diagonal transverse ridges of the mesiolingual cusps of the maxillary molars of the right side of the denture (the "balancing" cusps of the upper denture).

Next, with one divider point on the left condyle head of the gorilla mandible, the other point traces the buccal cusp ridges and grooves of the left side of the arch, and the ridges of the fifth or distobuccal cusps of molar teeth on the right side of the denture. (Fig. 7.) Thus, it is proved that the tooth structure of the gorilla, which is closely similar to that of human beings, has evolved in form and dimension to permit simultaneous cuspal cooperation on both sides of the dentures, during the lateral jaw movement performed by the pivoting of one condyle in this mandibular fossa.[2]

A front view of the gorilla skull, with the mandible in motion, shows the animal capable of closing the jaws in one lateral position and making a lateral shearing movement toward centric, through centric and beyond centric, to the opposite lateral position.

Next is seen a patient, in her late thirties, with bilateral balance of the natural teeth. The patient chews "dentyne" gum, which offers reasonable resistance, and, after making several shearing strokes, she is asked, without previous warning, to "shift." Her tongue picks up the gum, carries it to the other side of the mouth and stands it up edgewise between the upper and lower posterior teeth, where it is held in position for crushing and shearing by the tongue and cheeks. At the same time, the patient reverses the direction of jaw motion.

It is seen that the patient, on retracting the lips, closes in the right lateral denture position when the bolus is on the right, and shears to centric and past centric position, to the opposite lateral position. The jaw then opens and swings back to the place of beginning for another stroke. When the bolus is shifted to the left, the jaw reverses its swing, closing in the left lateral denture relationship and shearing through centric to the right lateral position.

This patient has an excessive overbite. In the extreme right lateral jaw movement, the lower teeth ride the upper right lateral and central incisors, which, as a result, have been moved to the right, opening up a space between the

central incisors. The right central incisor is seen to pump up and down in its socket at every masticatory stroke, and the futility of medication and curettage without correcting this excessive occlusal force is easily understood. In the protrusive jaw movement, only the anterior teeth make contact; the posterior teeth are separated, and the jaw force falls exclusively on the anterior teeth, which show considerable gingival and osseous resorption.

The next patient, in her late twenties, has an excessive vertical overbite. In protrusive position, this patient brings into contact only the incisors; in the lateral positions, the cuspids interfere, receiving full jaw force and preventing bilateral balance. The gingival condition is good except for hypertrophied rings around the anterior teeth.

This patient follows the same chewing routine of mandibular movement and of crushing and shearing as did the first patient, except that she shears from the initial cusp contacts in lateral position to the centric denture position only. She then opens the jaw, and returns it for another short shearing stroke from right lateral to centric position.

Patient No. 3, a man of about 50 years, has lost all second and third molars through periodontal pathosis. (Figs. 8-10.) The right first molars have a cross bite. The upper left first bicuspid bites buccally to the lower one and has a deep lingual periodontal resorption necessitating extraction of the tooth. Only the anterior teeth make contact in the protrusive jaw position, and in both right and left lateral strokes of the jaw, the long cuspids interfere, holding the rest of the dentures open. In each lateral jaw movement, the jaw force falls on the upper cuspid on that side of the denture, and since these cuspids have an abnormal mesial inclination, the jaw pressure has caused deep resorption on the mesial surfaces of these teeth, as shown by the x-ray pictures. Otherwise, the roentgenograms show the satisfactory level of healthy periodontal bone.

This patient chews from left lateral to centric position, even when the bolus is on the right side of the mouth, and has a very short shearing stroke, ending at centric position. This case is also shown after the occlusion has been bilaterally balanced and the incisal interference in protrusive relationship is greatly reduced by selective spot-grinding. (Figs. 10-11.)

Patient No. 4 has a centric interference, the dentures striking first on several cusp ridges of posterior teeth and sliding home to centric closure. (Figs. 12-13.) This is a quite common and particularly destructive form of pathologic occlusion. The first denture contact is on a few inclined planes, which thrust lower teeth anteriorly and upper teeth posteriorly, with deep interproximal vertical resorption resulting.

This patient, owing to his "locked bite," has a very short shearing stroke, almost a "chop bite" form of chewing.

Patient No. 5 has a Class 3 malocclusion. In centric closure, there is a marked interference between the anterior teeth, which has already cost the patient two upper central incisors. For mastication, the jaw moves forward to a "convenience" relationship. The patient has no shearing function, but chews with a vertical chop stroke.

Patient No. 6, aged about 22 years, has a bilateral balance of the natural teeth. There are no cavities or fillings and no gingival pathoses. In contrast to the jarring chop strokes of previous patients, this balanced occlusion functions with a precise, easy rhythm of jaw motion. Closing cusp-to-cusp in lateral relationship, the jaw carries the mandibular denture down multiple cusp planes and ridges to centric relationship. Moving onward through centric position, the mandibular teeth ride down the inclines of the upper lingual cusps, doing the major portion of the shearing on cusp contacts which, in the past, we have

considered to be balancing contacts, of importance only on the inactive side of the mouth.

These contacts between upper lingual and lower buccal cusps are here shown to be of major importance as shearing contacts on the working side of the mouth. Thus, it may be pointed out that, on the working side of the mouth, all cusp contacts are working contacts; whereas on the opposite side of the dentures, all contacts are balancing contacts.

Whether the patient chews on one side of the mouth or on both sides simultaneously, balanced occlusion is exceedingly important. It gives a long shearing stroke, utilizing the full occlusal surface of the upper molars, rather than merely the short buccal cusp ridges. Furthermore, it gives an equitable distribution of jaw force, which Waugh has shown to run from 100 to 300 pounds of pressure, over many teeth, on both sides of the denture.

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CLASSIFICATION AND TECHNIC FOR THE REMOVAL OF IMPACTED MANDIBULAR THIRD MOLARS

By Glenn J. Pell, D.D.S., Indianapolis, Ind.

IN the removal of an impacted mandibular third molar, the failure of the operator to recognize the obvious and to proceed in an orderly, surgically sound manner has been the main cause of necrosis, osteomyelitis and cellulitis, and a sense of resentment on the part of the patient and of disgust on the part of the operator, etc. Let us consider some of the things that are obvious. In order to operate successfully, we must locate the tooth in its anatomic position. We do this by a study of properly focused and developed roentgenograms, and a thorough clinical examination.

Now, what do we see or how much has the operator been trained to see by this examination? From the roentgenogram, he can study the relation of the tooth to the long axis of the second molar; the relation of the tooth to the ramus; the deflection of the tooth buccally or lingually; the degree of torsion; the depth of the tooth in bone; the comparative density of the bone; the curvature and abnormalities of roots; the pathosis present, and the relationship of the roots to the mandibular canal. From clinical study, one may note the inflammatory changes in pericoronal tissues due to infection; the accessibility, the mental attitude of the patient and the state of health of the patient, and may make observations which will aid in selecting the anesthetic agent.

After this study, we are ready to correlate the findings, classify the impaction and plan a method for removing the tooth. The above-mentioned studies have been made by men who have spent years

Read before the Section on Oral Surgery, Radiology and Anesthesia at the Seventy-Fourth Annual Midwinter Meeting of the Chicago Dental Society, February 17, 1938.

on this problem. Since they think it necessary to consider these various aspects of tooth impaction, why should the inexperienced ignore them or fail to procure the proper training if they intend to undertake this work?

For several years, we have been teaching a classification of impactions which, we believe, assists the operator to make a more comprehensive study of roentgenograms and points out the necessity of a thorough clinical examination of the patient. Similar classifications have been advocated by other men working on the subject.

The roentgenographic study is made in four parts: 1. The relation of the tooth to the ramus of the mandible. 2. The relative depth of the tooth in bone. 3. The relation of the tooth to the long axis of the second molar. 4. A careful search for complicating abnormalities.

RELATION OF THE TOOTH TO THE RAMUS OF THE MANDIBLE

Normally, the body of the mandible should develop sufficiently for the accommodation of the sixteen teeth of the lower arch. Impactions occurring in properly developed mandibles are described as Class I, and are usually caused by aberrations of eruption. In many cases, however, the body of the mandible does not develop sufficiently for the accommodation of the third molar, part of which will be found in the body of the mandible and the remaining portion in the ramus. These are designated as Class II. When the third molars are entirely or almost entirely within the ramus, the impaction is designated as a Class III. Obviously, other things being equal, an impacted tooth located in the body of the mandible will be much easier to remove than one entirely in the ramus, where access is difficult and the bone very dense, and where the tooth is likely to be in close proximity to the mandibular canal. Reparative processes of the ramus with heavy cortical bone are much slower than in the cancellous bone of the body of the mandible.

RELATIVE DEPTH OF THE THIRD MOLAR IN BONE

We have arbitrarily selected position A to represent those cases wherein the highest portion of the tooth is level with or above the occlusal plane of the second molar; position B, those cases wherein the highest portion of the tooth is below the occlusal plane but above the cervical line of the second molar, and position C, those cases wherein the highest portion of the tooth is level with or below the cervical line of the second molar. (In horizontal impactions, the highest portion of the tooth would be the distal surface; in disto-angular impactions, the tip of the mesial cusp.) Again, other things being equal, a tooth in position A, exposed in the mouth and only partially surrounded by bone, presents a far easier technical problem than one below the cervical line of the second molar.

RELATION OF THE TOOTH TO THE LONG AXIS OF THE SECOND MOLAR

For this study, we use George B. Winter's classification of angulation, which is well known and on which it would be difficult to improve.

COMPLICATIONS

Abnormal root curvature; hypercementosis; proximity to the mandibular canal; extreme bone density; cementum filling the space normally occupied by the dental follicle—any of these conditions can change what was primarily thought to be a simple operative procedure, to an involved operation demanding exceptional skill and ability on the part of the operator. All too often, these conditions are overlooked or ignored by the inexperienced dental surgeon.

Good roentgenograms are absolutely essential in all cases. There should be no distortion and the view should include

all of the third molar, the second molar and at least part of the first molar, as well as the structures below and behind the impacted tooth. The average angle of projection for third molar views is from 5 to 10 degrees above horizontal, with the rays directed through the contact point between the first and the second molar. Occlusal views are also needed in many cases.

A thorough clinical examination should be correlated with the roentgenographic study. There are many mouth conditions which may seriously complicate any operative procedure within the mouth, and which should receive careful consideration before the operation. Accessibility to the field of operation varies greatly in different individuals. Some of the conditions which may interfere with accessibility are: a large and uncontrollable tongue, inability to open the mouth wide enough for proper instrumentation and a small mouth with inflexible musculature.

Each case is an individual problem. The mental attitude of the patient and his ability to withstand the strain of the operation and to cooperate will guide the operator in selecting the anesthetic.

If, in every case, the operator will carefully follow the outline, he will be able to make an intelligent prognosis. Then, by self-analysis, he can determine whether his skill and experience is sufficient to justify his undertaking the responsibility of the operation.

OUTLINE FOR SYSTEMATIC STUDY OF ROENTGENOGRAMS OF IMPACTED MANDIBULAR THIRD MOLARS

1. Relation of the tooth to the ramus of the mandible.
   - Class I. Sufficient amount of space between the ramus and the distal portion of the second molar for the accommodation of the mesiodistal diameter of the crown of the third molar.
   - Class II. The space between the ramus and the distal portion of the second molar less than the mesiodistal diameter of the crown of the third molar.
   - Class III. All or most of the third molar within the ramus.
2. Relative depth of the third molar in bone.
   - Position A. The highest portion of the tooth on a level with or above the occlusal line.
   - Position B. The highest portion of the tooth below the occlusal line, but above the cervical line of the second molar.
   - Position C. The highest portion of the tooth on a level with or below the cervical line of the second molar.
3. The position of the tooth in relation to the long axis of the second molar (from George B. Winter's classification):

(1) Vertical	These may also occur in	a. Buccal deflection
(2) Horizontal		
(3) Inverted		
(4) Mesio-angular		b. Lingual deflection
(5) Disto-angular		
(6) Bucco-angular		c. Torsion
(7) Linguo-angular		

4. Complications:
   - (1) Abnormal root curvature
   - (2) Hypercementosis
   - (3) Proximity to mandibular canal
   - (4) Extreme bone density
   - (5) Follicular space filled with cementum

Methods of removal are many and varied. All are more or less successful in the hands of the men familiar with them. The mechanical problem is to place the aberrant tooth in a vertical position, so it can be removed from the socket. In order to do this, it is necessary either to remove bone from it, distally to it or buccally to it, or perhaps all three. Then, by leverage, it is forced into the space created by the removal of the bone until it can be lifted from the socket. If this space can be provided by dividing the tooth and removing the divided or split portion, the amount of bone to be removed; the operating time;

the amount of trauma to contiguous parts, and the amount of leverage necessary to dislodge the tooth are materially reduced. We have then accomplished much that will aid in repair and postoperative comfort of the patient. Such a technic I shall offer for your consideration.

EXTRACTION TECHNIC

To expose the site of the unerupted or partially erupted tooth, a muco-periosteal flap is elevated and retracted. The incisions for this flap must be surgically sound. Now, if necessary, bone is removed from the buccal aspect of the crown semicircularly to provide access to the buccal occlusal groove, into which is placed a sharp splitting chisel. A blow or two with the hand or engine mallet will, if the chisel is properly alined, split away a portion of the tooth. Enough of the crown is removed in this manner to provide space into which the remaining portion of the crown can be elevated. If the roots fracture, they can be teased forward into the space formerly occupied by the crown. Thus, we are providing space by removing tooth rather than bone. It is almost unnecessary to mention the fact that it is exceedingly difficult to split a tooth after it has become loosened. No attempt at elevating or loosening should be made prior to splitting. Sufficient space should be provided by removing tooth structure, to allow elevating the remainder with the least amount of pressure, thereby reducing the pressure on bone when using it as a fulcrum.

In some cases, when the tooth is located lingually to the second molar, it is almost impossible to aline the chisel in the line of cleavage. When this condition exists, a bibevel or spear point drill is used to drill a hole in the crown or neck of the tooth. A tapered four-sided punch may be inserted in the drill hole. The sides of the punch should bind before the end reaches the bottom of the hole so that it acts as a splitting wedge when struck a blow with a mallet. This will split the tooth very readily. The split portion is then removed.

In some cases, it will be necessary to remove a small amount of bone on the distal aspect to permit the removal of the split portion, because of the convex distal surface. In vertical and mesio-angular impactions, all that remains to be done is to insert a small lever mesially, from the buccal aspect, and rotate the tooth back into the space provided by the removal of the split piece. In horizontal impactions, it is frequently necessary to separate the remaining portion of the crown from the roots at the neck. This is accomplished by using the chisel or by drilling a hole or two, then splitting with the punch or chisel. The remainder of the crown is then removed and the roots are brought forward into the space formerly occupied by the crown. In Class II and III, distally inclined cases, the problem is to separate the crown from the roots. The removal of the crown provides ample space to bring the roots up and out.

The advantages of this method of procedure are obvious:

1. Incisions are less extensive, since little work is done distally to the crown of the tooth.
2. Bone cutting and removal are eliminated or materially reduced.
3. Injury to surrounding tissues and especially to the mandibular nerve is avoided, as forced elevations are unnecessary.
4. The operating time can be considerably reduced as compared to the all-bone-removing procedure.
5. Swelling is reduced because of less exposure of tissue.
6. Trismus is reduced because heavy pressure with elevators is not necessary.

505 Hume-Mansur Building.

FRACTURE AND DISPLACEMENT OF THE HAMULAR PROCESS

REPORT OF A CASE

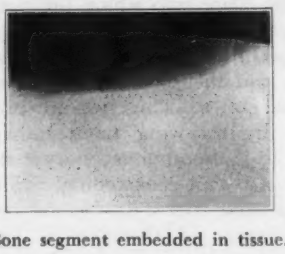
By Harry G. W. Voss, D.D.S., Racine, Wis.

THIS case of a fractured hamular process was interesting because it presented many angles that are not encountered in the daily routine of dental practice.

History.—A woman, aged about 65, in poor health, complained of much pain in the joints from rheumatism, pain in the throat, with some difficulty in swallowing, a feeling of tenseness in the throat and a soreness in the neck below the angle of the jaw.

There had been a difficult extraction of the upper left molars about five years previously, after which time, according to the patient, she had a "sagging" feeling in the throat on the same side. A physician removed her tonsils about one year after extraction of the molars, but the feeling persisted. The patient related that, two years previously, the condition became worse. After consultation with a throat specialist, she submitted to another operation, scraping of the side wall of the throat. The result of this operation was not satisfactory. A small reddened nodule which gave off a purulent exudate remained. The history also revealed that this nodule swelled at irregular intervals, causing greater discomfort, and would then almost disappear. About one year previously, the patient consulted another throat specialist, who made an exhaustive examination including roentgenograms of the head, neck, teeth and chest, Wassermann test and blood count, which revealed nothing. However, the patient was told that it would be necessary to submit to another operation, but being very much dissatisfied, she would not consent. She then consulted another physician, who referred her to me.

Examination.—On rechecking all the evidence at hand, especially the roentgenograms, it was found that none of them covered the area in question. With difficulty, a picture of this tonsillar area was taken, as follows: Owing to the highly sensitive throat wall, the film was placed extra-orally. An ordinary small dental film was placed flat against the posterior border of the ascending ramus, just below the lobe of the ear, and held in place with a piece of adhesive tape. The cone of the x-ray tube was removed, and the tube set close to the patient's lips, the central rays being directed through the open mouth, and aimed at the area to be roentgenographed. The accompanying illustration plainly shows the bone segment embedded in the tissue. Palpation of this area revealed a hardened flesh-covered protuberance, slightly movable.



Bone segment embedded in tissue.

Operation and Outcome.—Under procaine anesthesia, the segment of bone was dissected out of the tissue. The site of the operation was left open. Compound solution of iodine (Lugol's) was used to swab the area. Recovery was uneventful, and all symptoms slowly disappeared.

COMMENT

The bone segment, which was carefully examined, proved to be a part of

the hamular process. This was no doubt fractured at the time of the difficult extraction of the upper third molar five years previously. The retraction of the muscle attached caused the displacement, thus accounting for the segment in the side wall of the throat where the irritation was found.

This case shows the value of the x-rays in diagnosing unusual cases. It emphasizes the need for especial care in picturing the area in question, and for a new technic at times to obtain these pictures. It also indicates the need for greater care in the removal of upper third molars.

1419 Washington Avenue.

NUTRITIONAL FACTORS IN DENTAL DEVELOPMENT

By Craig D. Butler, M.D., Oak Park, Ill.

ALMOST every physician invited to speak before a dental audience has taken as his theme cooperation between the two professions, lauding past achievements of their joint effort, or making an appeal for closer harmony in the future. With full realization of the triteness of the subject, I cannot refrain from introducing my remarks with similar comment. Scarcely a generation ago, teeth seem to have been considered merely as addenda, like hair and nails, not a real part of the living body, structures created for a little use and pleasure after plaguing the child during their eruption, and before harassing the adult in the course of their decay. The dentist was seldom sought except for the relief of pain and that usually by extraction. He was a craftsman on a par with the barber and the blacksmith. Then, as prosthetic dentistry developed, he became an artist, making images in porcelain, silver and gold, but with little interest in the patient beyond the oral cavity.

Contrast to this state the present situation of general recognition of dentistry as a specialized field of medicine, and of the necessity of close cooperation between the physician and dentist, if the patient is to be well treated. Body welfare is so dependent on a healthy, well-functioning denture, and the development and health of the teeth are so dependent on optimum body function that the relation between the two professions has become a sort of symbiosis. Like the bee and the flower, one cannot exist without the other!

What were the steps in developing this relationship? Perhaps I can sketch them briefly. First, the dentist blamed most dental disease on body infections: measles, scarlet fever, typhoid fever, etc. Then the doctor said he could not keep his patients healthy when their food entered the body through a dirty, infected mouth filled with carious teeth which prevented proper mastication; and later, with the advent of ideas on focal infection, he charged most of the body's ills to infections in root abscesses beneath the dentist's works of art. This was mutual interest in one another's fields but did not always lead to mutual understanding, and friendly cooperation. Real progress

Read before the Section on Children's Dentistry—Mouth Hygiene at the Seventy-Fourth Annual Midwinter Meeting of the Chicago Dental Society, February 15, 1938.

came when the study of mineral metabolism, biochemistry and the rôle of vitamins occupied the center of the scientific stage. Researches in nutrition, such as those by Howland, Sherman, Hess, Mellanby and Steenboch, were correlated with histologic studies of tooth structure,[1] and with studies on the cause of caries by Bunting,[2] Boyd and Drain,[3] Percy R. Howe[4] and others. Gradually, some light was shed on the mechanisms behind dental disease, and on its relation to body economy. More recently, the spotlight has shifted to the rôle of the endocrins; to the influence of the glands of internal secretion on mineral metabolism, and tooth and bone formation, and their effect on general growth and on local growth of the jaws and face.

It may be of value to summarize some of the views on the effect of nutritional factors on dental health and to consider some of the current concepts of the endocrine functions as affecting mineral metabolism and the growth of bones and teeth.

This audience is too well aware of the voluminous researches of the past decade on the relation of the diet to dental health to need a recital of fundamental work on the requirements of minerals, vitamins and other food constituents necessary during pregnancy and early life, and at least desirable in adults, to effect the development and maintenance of a normal denture. We agree that a diet of adequate caloric value, containing liberal quantities of milk, vegetables and fruit, together with meat, eggs and whole-grain cereals, and supplemented with cod-liver oil or other vitamin concentrates, should furnish the building materials for proper tooth growth and development. Many groups of children maintained on such a diet have shown a low incidence of caries and developmental defects, and others on deficient diets have shown arrest of disease and improvement when changed to such a régime.

In spite of all the careful study, there is still considerable divergence of opinion as to the optimum amounts and source of minerals, and as to the rôle played by various vitamins in tooth development. As for calcium and phosphorus, which in combination make up 80 per cent of the substance of the tooth, it is the general belief that milk alone will give an adequate supply, yet Charles J. Bloom,[5] of New Orleans, has done much work to show the need of excess mineral in the form of dicalcium phosphate. He urges that it be added to the feedings soon after birth, that it be continued throughout childhood and that it be given in pregnancy.

Vitamin D in the diet, or formed in the body by action of sunlight, is essential to adequate mineral metabolism and bone and tooth formation. Deficiency of vitamin D not only results in a poor tooth structure prone to decay, but also in soft maxillae and facial bones which are readily distorted by abnormal forces, such as thumb-sucking and mouth-breathing, with malocclusion resulting.

The effect of vitamin A on the dentition is still controversial. Percy R. Howe,[4] working with rats, showed that, in its absence, the odontoblasts of the tooth pulp produced bone instead of dentin, and this bone was less resistant to caries. He once found bone deposited in human dentin. Mellanby[6] believes that vitamin A is a potent factor in preventing tooth decay. A recent report of a commission appointed to study tooth decay in England[7] compared the incidence of caries in groups of institutional children taking various combinations of vitamin A and D in addition to rather inadequate diets. They concluded that the administration of vitamin A "diminishes the incidence of caries, if it is given during the development of the teeth; that benefit may be obtained if the vitamin is given at a fairly late stage of development, and that when it is given after eruption of

the teeth, the onset and spread of caries is delayed." Bloch,[8] of Copenhagen, examined older children and adults who had recovered from severe vitamin A deficiencies except for partial or complete blindness, caused by xerophthalmia. In these people, he found no more dental disease than in others in their families whose vitamin A deficiency had been less marked, nor than in a control group whose diet had always been adequate.

Scurvy, severe vitamin C deficiency, causes swelling and bleeding of the gums in those who have erupted teeth, and shedding of some or all of the teeth. Howe showed that when animals received no vitamin C for from five to seven days, the odontoblasts ceased to form dentin, the pulp shrank and the dentin was resorbed or liquefied. When vitamin C was again liberally supplied, dentin formation was resumed within twenty-four hours. However, as Dr. Abt[9] pointed out to this group a few years ago, manifest scurvy in the human being is not characterized by tooth decay, but by gingivitis and hemorrhage.

The vitamin B complex has not been greatly incriminated in dental pathology. The growth factor may, however, have some influence on local growth of the oral structures.

There is still no reliable guide as to how much of these accessory substances is optimum. We know the symptoms of severe deficiencies, but we are not certain as to the exact effect of long-continued intake below or in excess of body requirement. Until there is a more accurate measure of vitamin and mineral requirement for good tooth development, we had best see that they are supplied in the diet in quantities ample to prevent signs of deficiency elsewhere in the body, and presume that dental requirements will be thereby fulfilled.

The phenomenon which interests me most is the very frequent finding of persons in whom diet and hygienic requirements apparently have been met, but who have poor, rapidly decaying teeth. During pregnancy, the patient's mother may have taken calcium and vitamin D. During infancy and childhood, the milk intake may have furnished calcium and phosphorus far beyond the body's requirement. Cereal, vegetables, meat and eggs have added extra phosphorus and other minerals. Fruits and vegetables and cod liver oil have supplied liberal amounts of vitamin, and yet the deciduous teeth have become extensively decayed. Even the permanent teeth may present cavities early in life. How can we account for this?

We try to shift the blame to the parents, implying that instructions were not followed, that the child had too much candy, did not take the cod-liver oil or had not cleaned the teeth well; yet I am sure we see many of these cases in which lack of cooperation is not to blame. In these children, not only the teeth suffer from lack of resistance. Roentgenograms of the bones, especially during periods of rapid growth, may show lack of density. The blood may or may not show abnormality of calcium or phosphorus content.

We have thought so much about calcium and vitamin D that we are prone to presume that, with plenty of these substances administered, normal bone and tooth growth must ensue. Hauling bricks and mortar to a building site does not assure the completion of the building; neither does putting materials into the alimentary tract assure their absorption and utilization.

The vagaries of calcium, phosphorus and metabolism are as intriguing as they are elusive. These minerals are excreted, as well as absorbed by the bowel wall, the balance depending on varying biochemical factors. Calcium is lost in combination with fats as hard soaps, and as insoluble phosphate. An acid reaction in the bowel favors calcium absorption, but

a general acidotic condition in the body reduces the deposition of calcium phosphate in the bones, and finally induces absorption from these storehouses.

The effectiveness of calcium medication depends on the solubility of the medicament in the bowel, and on the extent of its ionization. The chloride, the most soluble of the common salts of calcium, is used where rapid absorption is desirable. However, the more highly ionized the salt, the more readily it may combine with phosphorus compounds to form insoluble phosphates. When dicalcium phosphate is given, its absorption depends on its solution in the acid gastric juice.

Bacterial action in the bowel affects the availability of calcium. The intestinal content of breast-fed babies is acid, owing to the presence of acid-forming bacteria; that of babies fed cow's milk is alkaline. This is probably the chief reason that artificially fed babies develop rickets more readily than those breast fed, though cow's milk contains much more calcium (0.2 per cent) than human milk (0.035 per cent).

Bloom[5] believes that food is more often deficient in available phosphorus than in available calcium and so advises, as previously mentioned, the use of dicalcium phosphate as an adjunct to feeding. T. Wingate Todd[10] believes medicinal calcium is effectual only in the demineralization which takes place during periods of rapid growth and in pregnancy.

It is advisable to give medicinal calcium with acid fruit juice between meals, as its solubility is thus increased and it has less chance to be combined with fats as soaps.

The secretion of the parathyroid glands has a profound influence on mineral metabolism. An excess of this hormone causes absorption of calcium from the bones and its excretion from the body; whereas, with a paucity of parathormone, calcium absorption is delayed and the calcium-phosphorus balance in the blood is disturbed, tetany resulting. Extreme variations in secretion, sufficient to produce symptoms of tetany, or to cause cystic degeneration of the bones, are readily recognized, but the effect of subclinical variations in parathormone production, probably inducing sufficient disturbance of calcium metabolism to effect growth and development, may defy recognition.

The calcium and phosphorus content of the blood is often observed, and it serves as an index to calcium metabolism, for, in active bone rickets, the blood calcium content is from normal to high and the phosphorus is low; whereas, in spasmophilic tetany, the calcium is low and the phosphorus normal, or high. We must remember, however, that chemical content of the blood is not an index of the amount of mineral in the bones and teeth; nor does it indicate whether salts are being stored in or withdrawn from these structures. The blood serum content shows the amounts of calcium and phosphorus being moved around, or "in transit." These values are comparable to a quotation of the "car loadings" of a business commodity, indicating neither the amount in the warehouse nor the saturation of the consumer market.

These statements regarding calcium metabolism are intended to emphasize the fallacy of the idea that we know what we are talking about when we say that a given patient is "getting" the amount of mineral and vitamin needed to assure proper development. His alimentary canal may be getting enough, but the only way we know that his tissues are getting it is to see results; i.e., to observe proper growth and development. Proper treatment may rest in adjusting bacterial and chemical conditions within the bowel, rather than in prescribing additional calcium.

Another nutritional factor which is

emphasized by many works as of import in prevention of caries is the acid-base balance of the body. Meats, eggs and cereals contain mineral acids which, after oxidation of the organic constituents of the foods, leave an acid residue or "ash" which increases the acidity of the blood and tissues. In this condition of acidosis, there is a tendency for calcium to be lost from the body, and for body fluids, including saliva, to increase in acidity. Milk, vegetables and fruits, with the exception of prunes and cranberries, contain no such inorganic acids, and leave an alkaline "ash." It is, therefore, thought than an alkaline diet is favorable for protection from caries. This theory does not explain the freedom of the Eskimo, from caries when he lives on an exclusive meat diet.

Allergy is a popular subject in all medical thought today, and it finds its place in this discussion of nutrition because of the effect of allergic rhinitis on the shape of the face and the contour of the jaws. Of course, all allergic rhinitis is not of food origin; in fact, it is probably more commonly due to inhalants, but, in childhood, food proteins are apt to be the offending factors. The long-continued obstruction of the nose delays the development of the paranasal sinuses, and this in turn stunts the development of the face, and alters the shape of the maxillae and palate, causing malocclusion.[11] Todd[10] states that various allergic conditions are accompanied by a general demineralization, and that the consequent softening of the maxillary bones may lead to deformities.

As growth and development are the end of nutrition, and because there is at present so much interest in the endocrine control of general and local growth, a discussion on nutrition would not be complete without mention of the effect of disturbances of hormone secretion on dental development.

The recorded observations on the workings of the endocrine system are voluminous, yet the facts meriting clinical application are comparatively meager. The next decade will, I believe, see rapid strides in the realm of endocrinology. At present, it is a bit hazardous for the casual observer to attempt to distinguish fact from theory, and to choose between sound observations and overly enthusiastic guesses voiced by the workers in this field. On reading a recent excellent book on endocrinology, one gets the impression that most dental troubles are based on errors in the interrelationships of the products of the seven or eight main hormone-producing bodies. It is this interrelationship which is confusing and which makes clear-cut clinical pictures the exception. For example, secretions from the pituitary stimulate activity of the thyroid, parathyroids, suprarenals and ovaries; whereas its own activity may in turn be stimulated by thyroid, and suppressed by ovarian hormone.

Because of this interactivity, a certain symptom may be common to both excess and deficient activity of a gland and to derangement of two or more glands. Wolf[12] lists a tendency to caries as a symptom of hyperthyroidism, hypothyroidism, hypopituitarism, hypertrophy of the thymus, hypogonadism, diabetes, pregnancy, hyperparathyroidism and hypoparathyroidism. With this array, it is certain that caries cannot be diagnostic of any endocrine disturbance, but the list suggests that a patient with an unexplained tendency to caries deserves a careful metabolic examination to determine a possible endocrinopathic background.

The orthodontists have found the study of endocrine influence of great help in explaining some of their problems. Some excellent work has been done by them on the relation of normal cycles of growth and development, as influenced by the endocrine system, to jaw growth

and the movements of teeth; and, further, as to the relation between endocrine disturbance and malocclusion. Clinton C. Howard,[13] working as an orthodontist with the Good Samaritan Endocrine Clinic at Atlanta, and S. J. Lewis,[14] at the Merrill-Palmer School in Detroit, have pioneered in this work, and have published much of interest, to both the dentist and the physician. They have used x-ray studies of the bones of the hand as an index to growth and maturation. T. Wingate Todd,[15] of Western Reserve University, who is conducting a detailed study of growth in a group of children from infancy to maturity, has given us the best standards for judging growth progress.

There are certain deformities sufficiently characteristic of clear-cut diseases of the endocrine system to warrant listing. Acromegaly, a form of gigantism due to a tumor of the pituitary gland, results in an overgrowth of the mandible, a prognathous jaw with widely spaced teeth, which is not amenable to orthodontic treatment. These changes occur characteristically after puberty. The teeth and jaws are very hard and the teeth resist decay.

Howard[16] defines a group of children whom he describes as having "acromegalic tendencies," and who have a Class III malocclusion resistant to treatment because the deformity is due to an overgrowth of the bone.

Cretinism, or severe thyroid deficiency, characteristically exhibits delayed dentition and abnormal conformation of the jaws with crowded teeth and severe caries.

Hyperthyroidism, or toxic goiter, is accompanied by decalcification. The bones are small and lack density, and the teeth have poor enamel and readily decay. The patients stand dental procedures poorly, easily become fatigued and take anesthetics poorly.

Tetany, due to hypoparathyroidism, causes enamel defects with horizontal ridging.

Obesity, of pituitary type(hypofunction of the posterior lobe), is said to be characterized by a striking lack of dental disease—the teeth being even, well formed and highly resistant to decay. Is Bodecker correct in believing that a fat-containing "dental lymph" bathes the teeth with a caries-preventing substance? The peculiar immunity of obese persons to caries would suggest some favorable rôle of fat.

Hypopituitarism, anterior lobe deficiency, is said to be accompanied by a reduction in size of the lower jaw, with overcrowding of the teeth, which are small and susceptible to decay. Correction of this deformity is not permanent while the underlying disease exists.

While the foregoing symptoms are characteristic of severe endocrine disturbance, we are at present unable to recognize and evaluate the effects of minor deviations in hormone balance. It is probable that this presents a real problem, which we hope persistent research and intelligent clinical observation will clarify in the not too distant future.

It may be of interest to cite a case of this type in which the cooperation of the ophthalmologist, the orthodontist and the pediatrician was attended by a favorable result.

K. W., a boy, aged 11 years, came to Chicago from another city where he had been treated with some success for a Class II, Division 1, malocclusion. When he was first examined in my office, he was rather fat, with an uneven distribution of the adipose tissue which suggested some endocrine defect, but did not seem striking enough to indicate treatment.

Two years later, an ophthalmologist to whom he had been referred because of headaches reported a rapidly progressive nearsightedness, and asked for a metabolic checkup. The boy was then 13 years old, tall, and 15 per cent above average weight for age and height, not enough variation

to call obesity. The breasts were large, and the genital development was somewhat retarded. The extremities were long as compared to the body. Hair and skin were coarse and dry. The basal metabolic rate was —23. The latter findings indicated a mild hypothyroidism; the fat breasts and delayed genital development denoted some hypogonadism; all of which may have been due to decreased secretion of part of the pituitary gland.

As the thyroid condition was most apparent and easiest to treat, small doses of thyroid were given by mouth, together with a high calcium and vitamin diet. About this time, the patient's orthodontist told me that the improvement in his bite, which was made while he was in Detroit, had been lost before he came here for treatment, and that, in a long period of treatment, there had been great difficulty in maintaining correction.

Thyroid substance was given for two years, and, in this time, the eye condition improved, and the body proportions and sex development became quite normal. The mandible also developed very well, so that a fair orthodontic result was obtained. After puberty was well established, the patient could no longer tolerate the dose of thyroid which had previously seemed beneficial, the endocrine unbalance having apparently adjusted itself.

In this case, the observation of the ophthalmologist that the local trouble represented a metabolic defect led to improvement in the ocular, oral and general conditions. The dentist seeking the explanation of cases not responding to local treatment may, through the cooperation of an interested physician, discover an underlying abnormality of nutrition or of hormone balance which will at least clarify the problem, and may lead to untold benefit to the patient.

SUMMARY

Much has been learned of the pathogenesis of dental caries and alinement defects, and great improvement in dental health has been attained where known nutritional requirements have been met. Yet, in the words of Dr. Todd, "the detection and correction of unheeded and unacknowledged deficiencies in diet and health" will tax the ingenuity and combined skill of the dentist and the physician.

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PRACTICAL FULL DENTURE OCCLUSION

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FULL dentures constructed according to currently accepted standards are among the most successful of all artificial substitutes for missing human members. One need only compare them with artificial limbs or eyes to appreciate the relative superiority of dentures both esthetically and functionally. It is therefore distinctly to the credit of the profession that it is not content with the current product in this field and is unceasingly striving to supply dentures which shall more perfectly restore the lost chewing mechanism.

The growing variety of tooth forms available for denture work is evidence that we discern in this direction ample room for improvement. Given even the most perfect impressions, dentures constructed from them may be unsatisfactory in function and even destructive to supporting structures if the occlusion is defective.

It has always been understood that it is necessary, for the sake of comfort and efficiency, to establish some sort of integration between the functional movements of the mandible and the reciprocal engagement of the teeth which we call occlusion. We shall deal chiefly with that part of the occlusion which is most intimately concerned with the chewing efficiency and stability of the dentures; namely, the premolars and the molars. The incisors are chiefly esthetic in function, and their relation to stability is so well understood that little need be said about them.

We are well aware that occlusal disharmony in the natural dentition has a chain of undesirable and pathologic consequences, but these are slow in manifesting themselves, and the relation between cause and effect is often obscure, at least to our patients. In the years that pass before the penalties are assessed, mastication may be fairly efficient. With dentures, however, occlusal disharmony manifests itself immediately by bruising of the supporting tissues and inability of the patient to chew comfortably, and in the less obvious, but perhaps more costly, resorption of the alveolar processes on which we must depend for denture support. It is apparent, therefore, that although a good working occlusion is desirable in the natural dentition, it is indispensable in artificial dentures if comfort and efficiency are to be achieved.

The main purpose of our study of denture occlusion is to secure an arrangement that will enable the patient to chew effectively. This primary objective has tended to become obscured in the vapors of theory and dispute, of controversy over mechanical gadgets and minutiae of technic. Altogether too much of our thinking about the phenomena of occlusion has been concerned with what happens on the articulator, and too little with what happens in the mouth, the fundamental process of chewing having been almost forgotten. Dental students diligently learn the various elementary movements of which the mandible is capable, but they remain vague about the specific and orderly fashion in which these movements are organized into the function of chewing. It is as though they could form every letter of the alphabet, but had not yet learned to spell "cat."

It has come to be accepted, for in-

stance, that prosthetics is concerned chiefly with what happens when the teeth are directly in contact, because it seems quite apparent that cusps cannot collide and interfere with each other when the mandible is depressed and the teeth are separated by a clear space. We have been so anxious to achieve a freely balanced occlusion with the teeth *in* contact that we have neglected the fact that the severest strain on denture stability comes *before* the opposing teeth are actually touching. Biting stresses between the dentures are freely transmitted across the bolus of food, and dislocation of the lower denture can and does occur before

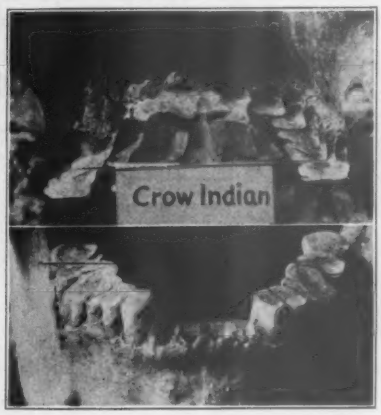

Fig. 1.—Characteristic occlusal inclination resulting from vigorous mastication of abrasive diet.

opposing teeth are in contact and balance.

In observing the occlusion of prosthetic teeth waxed up on an adaptable articulator, it is customary to look carefully for cusp interference in the abductive movement from centric relation to working bite. It is assumed that if this movement, from centric laterally to working bite, can be freely accomplished without cusp interference, the return to centric relation will be equally unimpeded. The fact that this test implies a totally unrealistic idea of the chewing cycle seems to have escaped general notice. The movement from centric relation directly outward to working bite is not functional: it is accomplished by the action of the external pterygoid muscle on the non-working side. In contrast, the return to centric relation is accomplished by the concerted action of the far more powerful temporal, masseter and internal pterygoid muscles. So important do we deem this idea that a few minutes will be devoted to a review of the evidence.

Grinding in bite-rims charged or faced with abrasive materials has been suggested (first by Paterson, of Baltimore, and later by Wadsworth, Hall and others) as a means of establishing a proper integration between the occlusal surfaces and the functional movements of the jaws in chewing. Since it seems quite scientific, let us examine this technic somewhat carefully. We assume that those areas of the rims which interfere with the prevailing movement of the jaws will suffer a greater number of collisions and will therefore be more rapidly abraded, while areas which do not interfere will tend to persist relatively unchanged. The final form of the occlusion rims should therefore be significant of the movement which shaped it, but unfortunately that movement is rarely if ever identical with the chewing movement. A patient with bite-rims in his mouth is not chewing anything: he is merely trying to oblige his dentist by moving his jaws about as best he can. Recognizing this deficiency of the bite-rim method, we determined to examine as many examples as possible of severely worn natural dentures. Through the courtesy of Drs. Clark Wissler and Harry L. Shapiro, of the American Museum of Natural History, we were enabled to study the museum collection of almost 12,000 human skulls. We believed that the same basic assumptions which we apply to the interpretation of the final form of bite-rims should be applied with equal force to ground-in natural teeth;

that is, that interfering eminences would be the first to wear away, and that non-interfering areas would tend to persist almost unchanged.

I have a few illustrations, representative of many hundreds of skulls that we examined, which show well-worn teeth. As students, we were told that as teeth wear down, they lose their cusps and become flat. In Figure 1, the teeth are flat, but not horizontally, and the occlusal surfaces are pitched downward linguobuccally The lower buccal and the upper lingual cusps have suffered severely from wear and are practically gone. The reason seems obvious: wear has erased those cusps which occluded with two others.

ing illustrations demonstrate different degrees of the same condition.

Figure 3 shows an intermediate degree of wear, and also another phenomenon of interest, the reversal of pitch as we approach the last molar.

Figure 4 shows this reversal also, with a moderate degree of wear, and an occlusal pitch which we have deemed safe to imitate in our denture work. The significance of the reversal of pitch in the last molar will be treated more fully later on.

Figure 5, included for comparison, shows how Dr. Monson oriented the chewing mechanism upon the surface of a sphere, with the teeth and condyles arranged at the terminal ends of various

Fig. 2.—Atypical "flat wear" occasionally encountered and probably due to strong horizontal element in habitual chewing movement. (Compare Figure 9, C.)

Figure 2 shows another specimen, for contrast. These teeth are flat too, but, in a way, quite different from the first case. This individual had a bite which was not different from that of the Crow Indian's. We believe that the explanation offered with Figure 1 is not adequate to account for all the facts and is not necessarily true. It seems to us more probable that these two individuals had different chewing motions or technics and that their teeth are worn differently because they were used differently. But unlike our cases with bite-rims, these teeth were worn down by actual functional movements, and not by aimless sliding. The follow-

radii. There is probably a measure of demonstrable truth in this idea from a strictly anatomic standpoint, but it will not stand extension into the realm of function. The teeth simply do not move upon the surface of such a sphere, however comfortably they may stand upon it. It is our belief that if the teeth followed the surface of such a sphere in function, they would gradually wear into closer and closer apposition with the sphere, and not out of apposition, as in the specimens displayed.

How did the teeth of these individuals whose skulls we have examined acquire the occlusal inclination shown? The

Monson theory is certainly inadequate to account for it, but perhaps we can see the light by other means.

All are familiar with the use of intra-oral and extra-oral tracing mechanisms for determining centric relation by means of a gothic tracing made by a vertical stylus or a pin on a horizontal plane. Figure 6 is a photographic motion study traced upon a vertical plane. It was prepared by focusing the camera on the gleaming head of a pin inserted between the lower central incisors, and giving a time exposure while the subject performed jaw movements to left and right lateral positions and return. You will observe that, in centric relation, the fixed point on the mandible, the movements of which we are recording, is closest to the maxillary plane. Any movement away from centric position causes a separation of the jaws, since the lower cusps are forced to climb out of the fossae of the upper teeth in which they fit during centric relation. This phenomenon has been ascribed by some dentists with whom I have discussed it to deep vertical overbite in the incisor and canine regions. Figure 7 is a similar graph made by a person who had an open bite anteriorly and whose incisors could not be brought into contact in any position. The multiplicity of tracings is due to "high lights" on the teeth. It is difficult to reconcile these graphs with the theory held by some that the mandible swings on an arc like a pendulum suspended from a center in the midline of the skull.

Thus far we have examined only a short segment of the chewing motion, that between working bite and centric relation. Now we examine the entire cycle. Figure 8 is reproduced from an invaluable article by G. Y. Hildebrand in the *Journal of Dental Research* for December 1937. It shows graphs made from motion pictures of the chewing movements of the stag and the goat. The occlusal surfaces of the teeth of the goat, shown in section D, are almost parallel to the segment of the chewing cycle which occurs adjacent to these teeth. Figure 9 shows three similar graphs of the human chewing movement. The differences among these three are slight, but one is inclined to suspect that they are sufficient to account for the different types of occlusal inclination observed in the severely worn teeth that we have studied.

Fig. 3.—Intermediate occlusal pitch with reversal at last molar. Upper teeth commonly show more wear than lower.

Fig. 4.—Moderate wear; slight occlusal pitch with reversal at last molar.

With so much evidence of the shape of the chewing cycle clearly before us, we can predict the direction in which force is applied to the morsel at any point of the movement and, even better, we can know the manner in which the reaction is going to affect the dentures. If the mandible is moving vertically upward, the primary reaction on the denture is vertically downward; if the denture is moving transversely, the primary reaction is transverse. As a preliminary to applying this information to the appraisal of mechanical tooth forms, it will be illuminating to analyze the action of anatomic teeth in chewing.

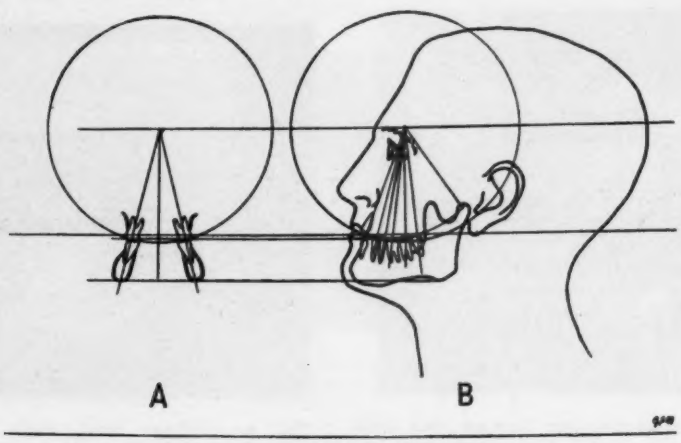

Fig. 5.—Diagram illustrating Monson's spherical theory.

In this way, we can discover the specific defect which is bringing about their abandonment by critical full-denture men, and can demonstrate a method of evaluation which is generally applicable.

Those who have read a previously published paper by one of us (M.A.P.) on this subject will recognize Figure 10, showing sectional views of opposing molars in the working bite relation, variously conceived. Part A shows a prominent tooth manufacturer's conception of the effects of biting pressure. The morsel is shown as being delicately nibbled between opposing buccal cusps, and the reaction is directed toward the crest of the lower ridge, or quite favorably for denture stability. Diagram B seems to us to present a more realistic, if less comfortable, state. We have long been accustomed to thinking about the way in which the teeth act on the morsel. This diagram is an attempt to show how the compressed morsel reacts on the teeth. (Newton's third law of motion states that to every action there is an equal and opposite reaction.) The inclined planes of which the biting surface of such a tooth is composed serve to disperse the force of reaction into various resultants at right angles to the inclines. Consequently, we have erected a perpendicular upon each of these cusp inclines to represent the resultant, and one of these is given especial emphasis (R_3). This is the resultant which arises upon the face of the lower buccal cusp, and which a lower denture is least able to tolerate.

When we wish to test a lower denture for adhesion, we press downward and outward upon the occlusal surfaces of the bicuspids. If we pressed downward and

inward, almost any lower denture would remain stable. It should be our endeavor to dispose the teeth and their occlusal surfaces in a way that will promote rather than impair the stability of the lower denture.

As soon as the patient is aware that his biting pressure threatens to upset either denture, he eases up in his efforts to close to centric position, and feels that his teeth are inadequate for their task. If he persists in bearing down, the lower denture will either shift laterally or tilt over entirely as the opposite (non-working) side rises from the mucosa. It is essential to realize that the mischievous effect which we are considering is not cusp interference in the commonly accepted

Fig. 6.—Above: Centric relation; showing overbite. Below: Pattern traced on film by light reflected by polished pinhead during alternate lateral sliding movements.

meaning of the term, and that it will never be detected by articulating paper.

Figure 10C shows opposing molars in the working bite "position." The so-called rectangular or morsal space is closely packed with resistant food. The mandible proceeds toward centric position, but the lower denture is retarded from following by the resistance of the morsel of food. As biting pressure rises to overcome this resistance, a progressively higher pressure is built up between the lingual flange of the lower denture and the adjacent lingual mucosa. The upper denture too may shift slightly to the median line under this force, and then a similar area of pressure develops between the upper buccal flange and the buccal mucosa of the maxillary alveolar ridge. These, as it happens, are the areas of most of the irritation that have to be corrected with new dentures, and it is more than a coincidence that these are precisely the regions where resorption is most rapid. Probably we have all observed that among elderly persons who have worn full dentures for many years, a larger proportion require a cross-bite arrangement of the teeth than among younger persons getting their first set.

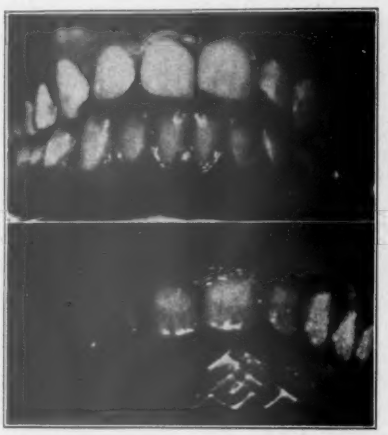

Fig. 7.—Above: Absence of occlusal contact in incisor region. Below: Vertical gothic arch traced by highlights on lower teeth during alternate right and left lateral movements, despite absence of incisal overbite.

Figure 11 shows how flat cuspless teeth (such as Hall's and Meyerson's, but ignoring accessory carving) may be treated as inclined planes and the reaction to chewing pressure be demonstrated by constructing a parallelogram of forces. Diagram B is a composite showing first how one may calculate the force required to roll a heavy cylinder (such as a drum of telephone cable) up an inclined plane onto a motor truck. If the drum weighs

12 cwt., a power just over 4 cwt. is sufficient to move the weight up the incline. The same incline is then to be regarded as forming the occlusal surface of a cuspless tooth with the smaller outline showing an inclination such as is required for compliance with the Monson theory. It will be seen that occlusal pressure (here assumed to be vertical for the sake of simplicity) generates a component directed toward the buccal side of the tooth and tending to turn the denture in the direction of diminished stability. The larger outline shows a tooth pitched in the opposite fashion (Avery), whereupon the occlusal pressure tends to turn the tooth in the lingual direction, or in the direction of increased stability.

Part A of Figure 11 demonstrates another difference between the two occlusal inclinations. The upper figure shows a pair of opposing cuspless molars with occlusal surfaces disposed as in compliance with the Monson spherical theory. The dotted lines show the direction of movement toward centric position, and also form the boundaries of the area within which food is under pressure.

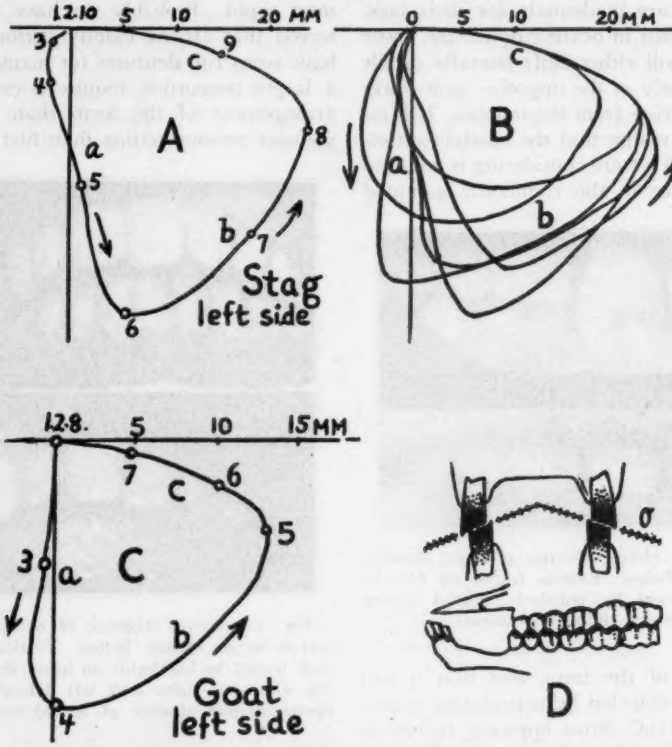

Fig. 8.—Motion studies of stag and goat chewing on left side. (From G. Y. Hildebrand in the Journal of Dental Research.) A: Composite of stag's mandibular movements in chewing. B: Individual cycles superimposed. C: Composite of movements of goat in chewing. D: Transverse occlusal inclination of goat's molars; showing substantial parallelism to line of movement during last and most important part of chewing cycle.

Food outside the parallelogram formed by these dotted lines and the occlusal surfaces is not under compression, since it is in contact with only one unopposed occlusal area and therefore it does not react on the tooth. The lower figure shows an identical arrangement except that the occlusal surfaces are pitched in the opposite direction, or in the fashion we employ and recommend. Comparing the parallelograms in which food is confined and under pressure, we can see that the Monson arrangement compresses a wider segment of the morsel (26.6 as compared to 20.0 mm. in the diagram) and thus must overcome 33 per cent more resistance in closing to centric position against a mass of food. Thus, it will be seen that the advantage of narrower occlusal surfaces is secured without

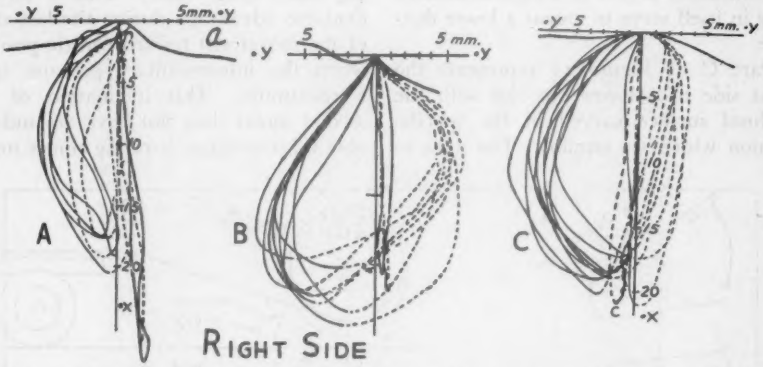

Fig. 9.—Chewing cycle of three different human subjects; movement of point infradentale (mesial contact points of lower central incisors) in normal mastication. Dotted lines: Opening movement. Unbroken lines: Closing movement. (From G. Y. Hildebrand's "Mandibular Kinetics," in *J. D. Res.*, December 1937.)

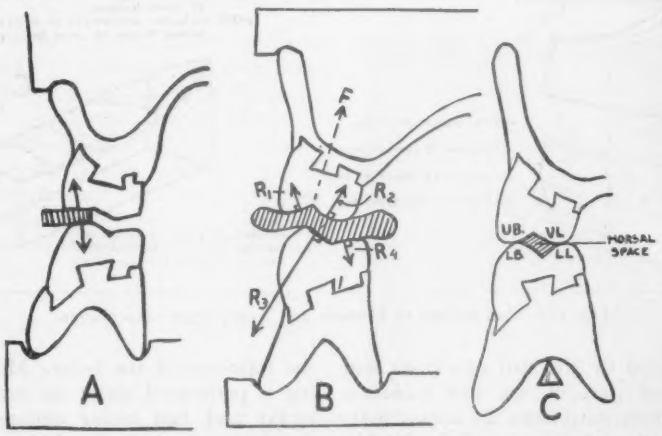

Fig. 10.—A: Reaction of molar teeth to presence of compressed morsel, according to tooth manufacturer. B: More realistic view: Reaction to presence of morsel of occlusal inclined planes presented by anatomic molars during closure. C: Working bite "position"; with morsal space packed with food under rising pressure as lower molar moves to centric position.

diminishing the width of what Sears has so aptly called the food table. If the teeth are very narrow, the patient will need to employ greater muscular effort to assemble the morsel on the chewing surface after each closure. Such excessive muscular action of tongue and cheek may in itself serve to unseat a lower denture.

Part C of Figure 11 represents the right side of a lower bite-rim with the occlusal surface carved in the specific fashion which we employ. The area to be occupied by the two premolars and the mesial part of the first molar is pitched downward from the lingual margin. The second molar area is inclined in the opposite way, downward from the buccal margin toward the lingual. A conventional curve of Spee is evident on the buccal border of the rim, but the lingual border is practically straight. The zone between the two diametrically opposite inclinations (comprising adjacent areas of the occlusal surfaces of the first and second molars) is ground to assure a smooth transition. The recommended reversal of pitch in the last molar is employed because it endows the dentures with balancing contact on the non-working side. (Fig. 12D.) This is an undeniable advantage during the last stage of the movement toward centric position when the intermaxillary pressure is at a maximum. This inclination of the second molar does not have an undesirable reaction since it rarely comes under the influence of the bolus. Most chewing is performed about the second premolar and first molar regions. These show severest wear in the skull specimens. The upper and lower teeth are ground to stand squarely on these surfaces.

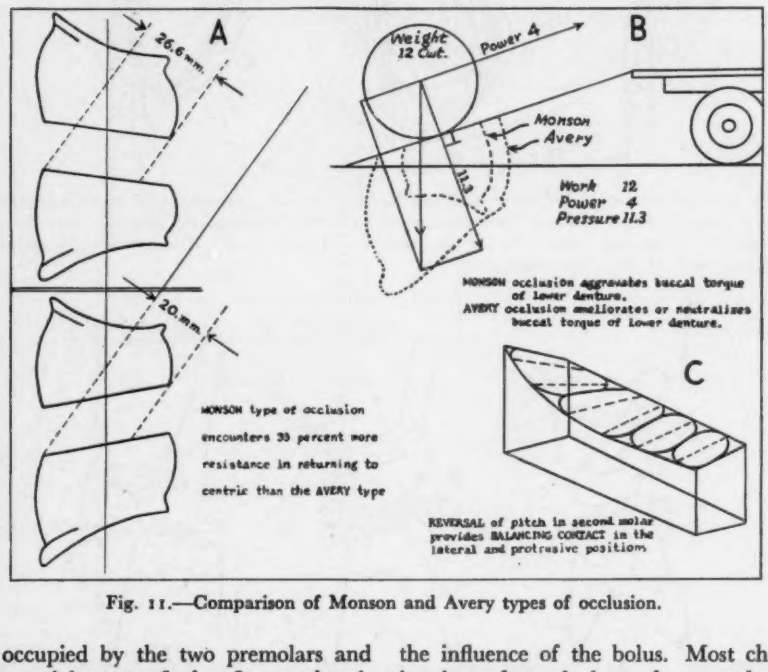
A
26.6 mm.
20 mm.
MONSON type of occlusion encounters 30 percent more resistance in returning to centric than the AVERY type
B
Weight 12 Lbs.
Power 4
Monson
Avery
11.3
Work 12
Power 4
Pressure 11.3
MONSON occlusion aggravates buccal torque of lower denture.
AVERY occlusion ameliorates or neutralizes buccal torque of lower denture.
C
REVERSAL of pitch in second molar provides BALANCING CONTACT in the lateral and protrusive positions

Fig. 11.—Comparison of Monson and Avery types of occlusion.

It is now apparent why the occlusal form of the posterior teeth must be rendered compatible with the chewing motion which is characteristic of the species.

Absence of such compatibility is penalized by instability of the denture bases, and loss of chewing efficiency and comfort. Our patients are mainly middle-aged and elderly, fixed in their habits and not amenable to learning new movements. Their chewing technic is a deeply established reflex action, normally as unconscious as the lid reflex, and with what hope of success can we presume to change them from a normal chewing motion to a new and abnormal one? Is it not better to provide them with teeth compatible both with life-long habit and with the requirements of denture stability? Nobody can deny that the natural molars are efficient as long as they are securely supported by roots, periodontal membrane and alveolar process. But natural molars make such heavy demands on support that even the natural parodontium often cannot meet them and it therefore breaks down. Denture bases, of course, cannot compare with the natural supporting structures.

Artificial teeth satisfying the special requirements of full dentures will be found to resemble closely the severely worn natural teeth seen in Figures 1 to 4. Such teeth can be readily derived from several of the available forms of non-anatomic posterior teeth, such as Hall's, Meyerson's and Swenson's. It is only necessary to pitch the occlusal surfaces of the lower posterior teeth downward toward the buccal surface. In practice, we find Hall's teeth most amenable to this treatment. Since these teeth, as manufactured, are meant to be set on a spherical template, the amount of grinding

Fig. 12.—Dentures in three contact relations. A: Centric relation, front view. B: Centric relation from below; showing marked overjet. C: Working bite; second molars out of contact. D: Balancing bite relation. The lower second molar is in contact with the upper molars.

Fig. 13.—Perspective views of dentures, showing anti-Monson transverse occlusal pitch and reversal of pitch at second molars for balancing contact in eccentric positions.

necessary to assure the required occlusal pitch can be minimized by using the upper bicuspids and first molar in the lower jaw, and vice versa. The second molars are not transposed, for reasons which have been suggested in the discussion of Figure 11C. (See also Fig. 12D and 13.)

Figure 13 presents perspectives of a set of dentures now in service, showing the occlusal inclination and the reversal at the second molars, upper and lower. Figure 12C and D show how the second molars tend to remain out of contact in the working bite, and come into desirable balancing contact on the nonworking side. The exact inclination of the second molars both sagittal, to produce a curve of Spee, and lateral, for balancing contact, is adjusted in the mouth at the time of trying in the waxed-up dentures. The tranverse pitch of the occlusal surfaces of the premolars and mesial half of the first molars is about 8 degrees at present. As our confidence in the safety and superiority of this method has increased, we have ventured to use a steeper pitch. In a personal communication, S. K. Avery (who with his brother originated the anti-Monson transverse inclination) recommends a pitch of 20 degrees throughout, although his arrangement affords no balancing contact. But since the advantage to the lower denture is secured at the expense of the upper, we deem it prudent to proceed with care.

A frequent question concerns the factors in increasing or decreasing lateral inclination. Primarily, this depends on the operator's judgment or appraisal of the probable relative stability of the upper and lower base-plates, based on data secured from preoperative examination of the mouth, study models and observations secured in the course of centric registration, etc. If the upper baseplate promises to be very stable, and the lower ridge is poor, an increased transverse pitch may be employed in order to borrow a larger portion of the excess stability of the upper and bestow it on the lower. It must be remembered that the utility of a set of dentures in mastication is determined by the stability of the less stable denture, just as the strength of a chain is determined by the weakest link.

SUMMARY

The mandible can apply pressure only to the tissue surface of the lower baseplate. If the resistance is slight, the denture is ordinarily carried along in the direction of the mandibular movement. But when an obstruction, such as a mass of food, is encountered by the teeth, it is not sufficient to consider only the action of the teeth on the morsel: quite as important is the reaction of the compressed morsel on the teeth and the dentures. That every action evokes an equal and opposite reaction is a law fundamental to physics. It is the reaction of the compressed morsel of food which so often and so mysteriously upsets our laboriously balanced dentures. The narrow view that only occluding cusps create occlusal traumatism must be revised to admit that the food itself is the major occlusal impediment, and that articulating paper can never help to locate and eliminate its effect.

With anatomic teeth and with most mechanical teeth now available, this phenomenon tends to shift the upper denture in the direction of increased stability, and the lower toward decreased stability. We propose to reverse this effect, taxing the upper denture, relatively rich in stability, for the sake of the lower, notoriously poor in stability.

The orthodox view of denture occlusion requires harmony in centric and in several eccentric positional relations. It is *our* plea that dentures be stabilized by integrating the occlusion with the entire chewing cycle, rather than with a few selected station stops. As has here become apparent, Nature has shown us how this can be done; but in order to do it intelligently, it is essential that we

clearly understand the shape of the entire chewing movement.

By judicious use of non-anatomic tooth forms, we can control the reaction of the compressed morsel so that it will tend to stabilize rather than dislocate the lower denture, and so that less force will be required to overcome the resistance of the food in moving to centric position.

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SURGICAL PREPARATION OF THE MOUTH FOR ARTIFICIAL DENTURES

By DON H. BELLINGER, D.D.S., Detroit, Mich.

THE ever-increasing interest of the dental profession in prosthodontia and dental surgery; the relative frequency of mouth abnormalities that interfere with denture construction and the importance of their correction in order to obtain the best esthetic and functional results, and the multiplicity of possible etiologic factors in these abnormalities are among the reasons for this presentation.

Generally speaking, prosthetic dentists have failed to avail themselves of the full benefits to be derived from the surgical correction of mouth abnormalities that interfere with denture construction. In the past, the dentist has attempted to overcome these mechanical difficulties by his own ingenuity, and it must be said that his efforts have been commendable. However, many of these cases are of such nature and extent that, in spite of ability and ingenuity, there is a sacrifice of esthetic values and function.

The responsibility of recognizing and advising treatment for these cases belongs to the prosthodontists, but it becomes the responsibility of the dental surgeon to devise ways and means for their correction and to carry them to a successful conclusion. The surgeon's efforts should be to assist the prosthodontist by placing the dental arches in as nearly normal condition and relationship as possible. This can be attained only by a thorough grounding in surgical principles, both oral and plastic, and a detailed understanding of modern denture technic; tissue control and repair, and ridge form for denture retention.

Read before the Section on Oral Surgery, Radiology and Anesthesia at the Seventy-Fourth Annual Midwinter Meeting of the Chicago Dental Society, February 17, 1938.

The prosthetic dentist finds a friendly ally in the dental surgeon who, at the time of teeth extraction, gives attention to the form, shape and relationship of the alveolar ridges. In general, there are two distinct facial types that require preoperative recognition and planning in order to avoid operative mutilation of the ridges during extraction of the teeth.[1]

The first, or square, type (Fig. 1A) is characterized by the appearance of compactness of the facial features. The malar bones are low, the alveolar ridges short and thick, with heavy buccal and labial plates of bone in which the teeth are firmly set. The musculature of the cheeks is heavy and well developed. Such cases, as a rule, require little alteration of the investing tooth structures, but do require careful extraction of the teeth to preserve the alveolar ridges. The firmly set teeth require considerable pressure and manipulation for their removal. Long fragments of buccal and labial plates of bone, especially in the molar and cuspid areas, may be broken away with the teeth. Likewise, roots may fracture and require considerable bone dissection to promote recovery. Unless the extractions are done according to a predetermined plan, designed to preserve the investing tooth structures, the ridge may be mutilated to the extent that when healing is complete, an adequate base is wanting.

Fig. 1.—Models of jaws of extreme facial types. A, square type. B, tapering type.

Fig. 2.—*Torus palatinus.* Removal of these bone outgrowths is indicated only when they interfere with prosthetic construction.

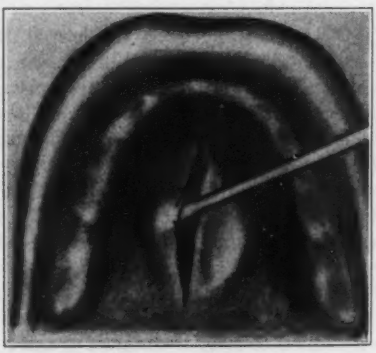

Fig. 3.—Incision preparatory to exposing and removing *torus palatinus.* Lateral incisions are rarely necessary.

The second, or tapering, type (Fig. 1B) differs from the square type in that the alveolar ridges are higher and are lacking in bone thickness on the labial and buccal aspects. The malar bone is high, the chin is pointed, and the cheeks are thin, this type affording better visibility and accessibility. Owing to the comparative thinness of the buccal and labial plates of the alveolar bone, extraction of the teeth is much more easily accomplished than in the former type, but the investing tooth structures require more alteration for a properly shaped ridge.

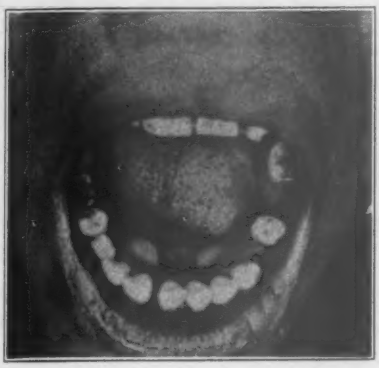

Fig. 4.—Bone excrescences on lingual aspect of mandible in bicuspid areas. They frequently produce undercuts and require removal.

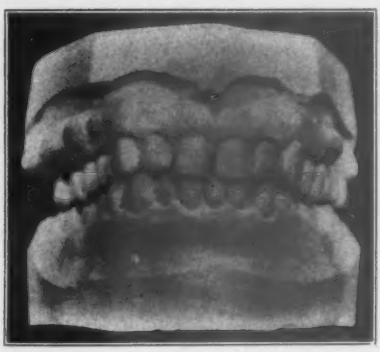

Fig. 5.—Bone excrescences of buccal plate of maxillae.

Preoperative recognition of these anatomic variations and utilization of a surgical technic to preserve the investing structures of the teeth during extraction will, in large measure, determine the shape and form of the stress-bearing foundation.

The alteration of the osseous structures, referred to as alveolectomy, has met with universal acceptance when properly practiced. In the majority of cases, barring developmental and acquired abnormalities, it entails nothing more than the removal of the irregular and sharp bone edges, shaping of the ridges and suturing of the mucoperiosteal flaps over them. The alveolar bone is exposed either before or after extraction of the teeth, the time being dependent primarily on the anticipated difficulty of the extraction. After the teeth are removed, the sharp irregular edges of bone are smoothed and shaped with sharp,

Fig. 6.—Enlarged tuberosity with buccal undercut.

thin-bladed rongeurs. All pronounced undercuts are removed. The ideally shaped ridge is short enough in a vertical direction to prevent the showing of denture material during lip function. For maximum retention and stress-bearing surface, the shape of the ridge should conform as closely as possible to an arch. A high thin ridge does not furnish the retention nor remain as stable as does the flatter and broader type. Neither does it furnish the opportunity of setting the teeth at right angles to the seating base. Failure to construct such an arch results in trauma and excessive bone change. Little if any reduction of the palatal or lingual aspect of the ridge is required other than to smooth off the sharp margins. Throughout the entire procedure of extraction and ridge preparation, cau-

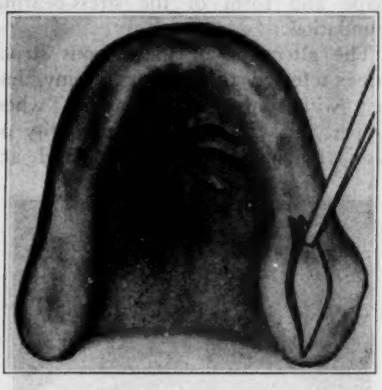

Fig. 7.—Excision of wedge-shaped section of tissue to reduce downward overgrowth of tuberosity.

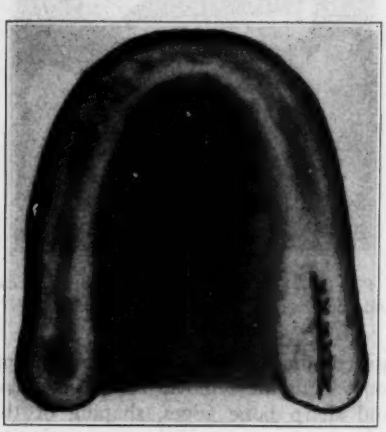

Fig. 8.—Mucoperiosteal flaps sutured over reduced tuberosity.

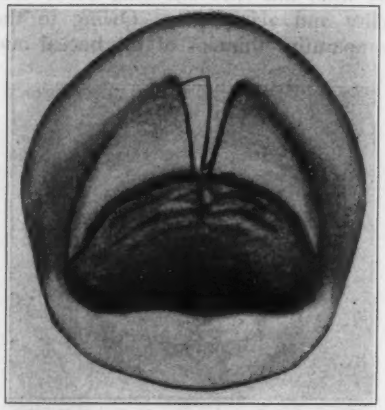

Fig. 9.—Z type of incision utilized in raising abnormally attached labial frenum. This method is employed in raising muscle attachments and narrow adhesions.

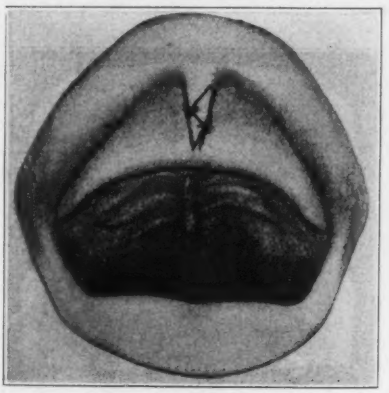

Fig. 10.—Flaps formed by Z incision transposed and sutured. No raw surface is left exposed and there is no puckering of the mucous membrane.

tion should be exercised to preserve the partition of bone between the tooth sockets. New bone cannot develop in excess of its periosteal covering, and unless a properly shaped framework is provided,

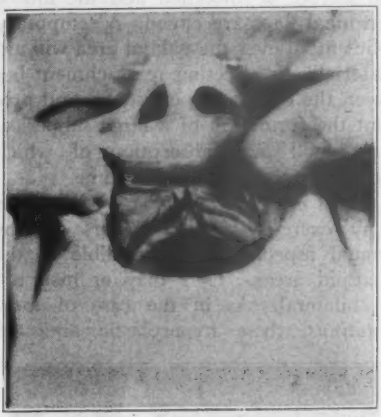

Fig. 11.—Localized hypertrophy of anterior portion of upper jaw caused by presence of upper denture articulated with only lower anterior teeth.

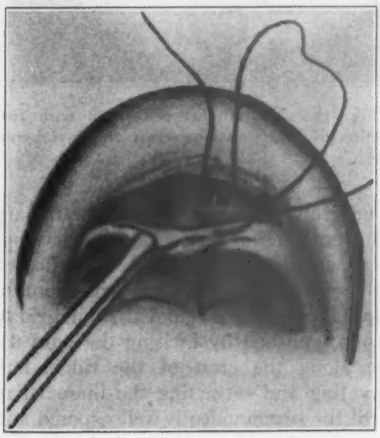

Fig. 12.—Incision and submucous dissection of hypertrophied tissue. The mucous membrane flap is sutured to the periosteum.

the eventual contour of the ridge will not be all that is desired. The mucoperiosteal flaps are sutured over the ridge, any tension that tends to alter or efface the mucobuccal fold being avoided.

All degrees of variation from normal intermaxillary relationship exist, and it is impossible to describe definite procedures for correction in every case. Suffice it to say that a procedure designed to establish as nearly normal relationship as possible between properly shaped

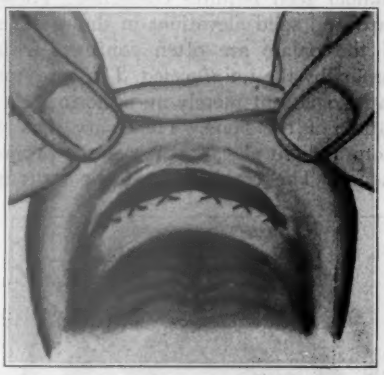

Fig. 13.—Mucobuccal fold extended by suturing flap as high as possible.

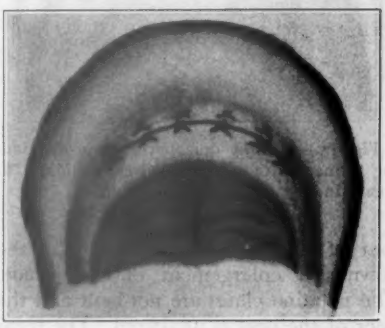

Fig. 14.—Mucous membrane flap sutured to close existing defect. Mattress sutures passed through the full thickness of the lip and tied outside are often used to advantage in closing the defect.

stress-bearing ridges is all that can be expected. The efficacy of the procedure is dependent on proper diagnosis, surgical technic and a predetermined plan as a basis of operation.

Mouth abnormalities unfavorable for and interfering with the construction of esthetic and serviceable dentures have been classified by Kazanjian[2] as (1) developmental abnormalities and (2) traumatic abnormalities.

One of the most frequent developmental abnormalities observed is *torus palatinus*. Only an occasional one of the number seen requires correction. These hard and solid elevations in the midline of the palate are often confused with tumors by the uninformed. They are not pathologic, but merely an abnormal elevation of the bone. They vary in size from a slight elevation to a large prominence. The consistency of the torus is

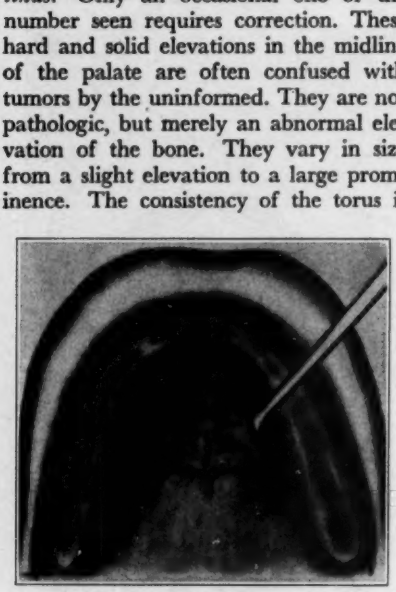

Fig. 15.—Raising mucoperiosteum of palate for formation of blood clot and ultimate increase in soft tissue thickness.

that of spongy bone, produced by the downward enlargement of the diploe. The palatine plates are not bent and the floor of the nose is unaltered. The *torus palatinus* begins to attain an appreciable size after puberty, when it gradually and steadily increases in size until the skeleton has attained its full growth.

The most satisfactory advice in regard to treatment of these elevations is that they should not be disturbed unless they are obstacles in the way of retaining dentures. If, on account of their size and shape, removal becomes necessary, it is easily accomplished by an anterior posterior incision over the area and retraction of the soft tissues until the prominence is well exposed. (Fig. 3.) The redundant bone is removed with chisels, the surface is smoothed and the mucoperiosteal flaps are closed. A temporary splint fitted over the palatal area will aid materially in effecting reattachment between the bone and periosteum and prevent the formation of a large subperiosteal blood clot, absorption of which would lengthen the healing time.

Torus mandibularis (Fig. 4) is a dense bony excrescence that occurs on the lingual aspect of the mandible in the bicuspid areas. They may or may not be bilateral. As in the case of *torus palatinus*, these hyperplastic areas of

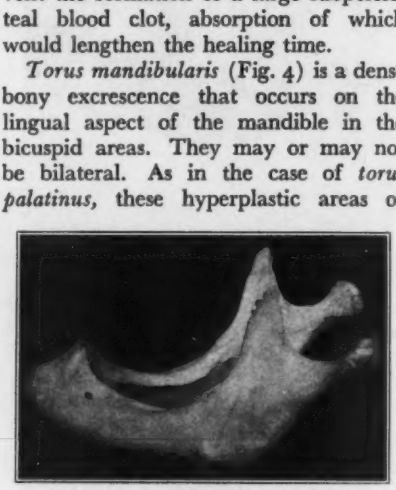

Fig. 16.—Mandibular resorption with formation of sharp alveolar crest and mylohyoid line.

bone grow slowly and remain stationary after completion of the skeletal development, and their removal is indicated only when they interfere with denture adaptation. Their removal submucously is accomplished by incising the gum tissue along the crest of the ridge, and elevating and retracting the lingual flap until the prominence is well exposed and removing it with mallet and chisel.

Bone excrescences of the buccal and labial plate of the maxillae (Fig. 5) develop in a manner similar to the bone excrescences just described. They create deep undercuts, over which it is impossible to adapt a denture and obtain

peripheral seal. The technic for the removal of these osseous excrescences is essentially the same as that described for alveolectomy.

Hyperplasia of the maxillary tuberosities is primarily observed in a narrow, highly arched palate. Frequently, the enlargement within these regions is merely hypertrophy of the gum tissue. Enlarged tuberosities that present a distinct undercut on the buccal or palatal surfaces (Fig. 6) and those that project downward sufficiently to interfere with adequate space in which to insert dentures call for correction. This is accomplished by excising a wedge of tissue at the most dependent part of the protuberance. (Fig. 7.) If bone overgrowth has produced undercuts, the wedge of tissue having been removed, the flaps are raised from their attachments and the necessary bone is removed. If the palatal and buccal flaps do not approximate easily and evenly, the excision of a submucous wedge of tissue from one or both flaps will further reduce the vertical length of the tuberosity and allow for better approximation and retention of the flaps with sutures. (Fig. 8.)

The maxillary frenum may retain to adult life its infantile arrangement of reaching to the incisive papillae. It may be so extensive as to cause an abnormal pull of the lip with a tendency to produce an extra fold visible beneath the vermilion border in smiling. In other cases, the lip develops a flat appearance, with derangement of its normal contour. In any case, it contributes to the unseating of a denture.

Repair of these fibrous bands is best accomplished by utilizing a modification of one of the oldest of plastic surgery principles; namely, the Z incision. (Fig. 9.) A vertical incision is made full length of the band, and the mucous membrane on each side is undermined extensively. Two horizontal incisions, made on opposite sides, one close to the alveolar ridge and the other at the juncture of the frenum and the mucous membrane of the lip, are united with the vertical incision. The flaps thus formed are transposed, each to occupy the position formerly occupied by the other, and sutured. This method has the advantage over other methods that no raw surfaces are left exposed and there is no distortion

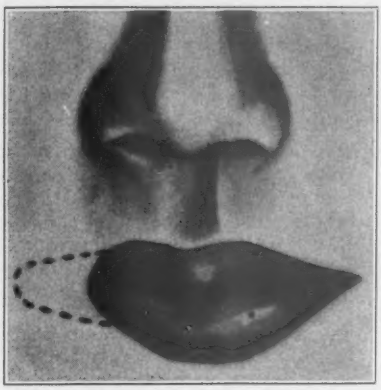

Fig. 17.—Extent and shape of constricted mouth opening marked on skin.

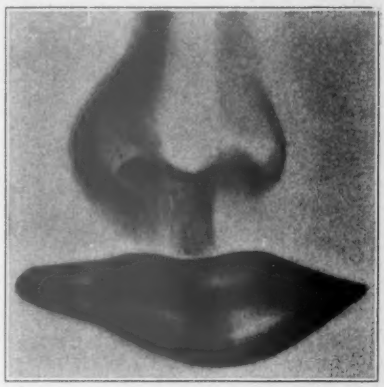

Fig. 18.—Quadrilateral flap of skin and subcutaneous tissue excised, leaving mucous membrane intact. The mucous membrane is incised to form three flaps as outlined by the incisions.

of the labial mucous membrane. (Fig. 10.)

Overdeveloped and abnormally attached muscles of expression and mastication present a denture problem not unlike that of the abnormally attached labial frenum. The mobility and activity of these bands tend to unseat a denture during their functional movements. The principal offenders are the *caninus* and *quadratus labii superioris* in the upper jaw and the *mentalis* and *quadratus labii inferioris* in the lower jaw. With the buccinator, these muscles describe, to a large extent, the peripheral boundary of the denture on the buccal and labial

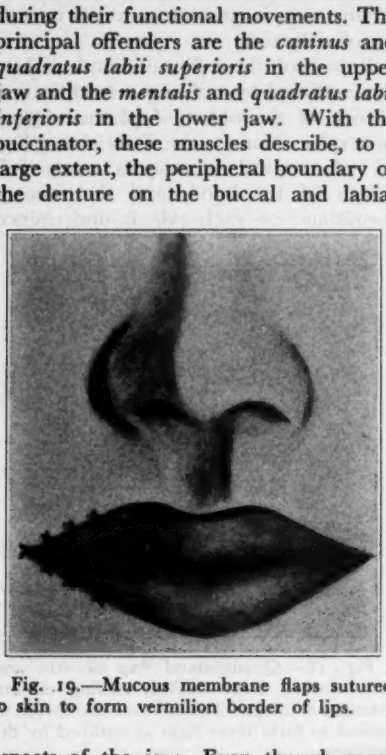

Fig. 19.—Mucous membrane flaps sutured to skin to form vermilion border of lips.

aspects of the jaw. Even though overdeveloped and abnormally attached, the visible portion of the muscle in the vestibule of the mouth is represented by a narrow band between the lip or cheek and the mucous membrane of the ridge. These muscle bands are obliterated by the procedure just described for the obliteration of labial fraena with the addition of freeing the muscle fibers from the periosteum before suturing the flaps.

Traumatic malformations have a wide variety of causes, prominent among which are the prolonged wearing of dentures that are no longer well adapted to the ridges, the accidental injury to bone and soft tissue during teeth extraction and the wide variety of traumatic injuries to which the face and jaws are exposed.

Localized hypertrophy of the mucous membrane is usually seen in the upper jaw, especially in the anterior region, where an upper denture has been articulated only against the lower anterior teeth. (Fig. 11.) In this hypertrophied tissue, there is a uniform increase in size and number of all the cellular elements. It forms as the result of long continued or intermittent irritation from the denture and is accompanied by resorption of the supporting alveolar structures. Of the many technical procedures described for its correction, none produce uniformly better results than the one advanced by Kazanjian[1]:

> The removal of flabby tissue from the anterior part of the upper jaw should not be confined to mere excision of the tissue, since that would result in a flat surface without buccal extension. A successful operation not only should eliminate the excessive flabby tissue, but should leave well defined borders high in the buccal fold.

In describing the fundamental principles for the operation, it must be borne in mind that minor modifications are necessary to meet variations of individual cases.

A horizontal incision is made high in the mucobuccal fold parallel with the alveolar ridge. This incision is not carried through the periosteum, but well down to it. The flap is dissected from the periosteum downward and the submucous hypertrophied tissue is dissected from the everted flap. (Fig. 12.) If folds of hypertrophied tissue have formed over the rim of the denture and do not smooth out well, they are excised. The flap thus formed is fitted and sutured to the periosteum as high on the labial surface of the ridge as possible. (Fig. 13.)

This extends the mucobuccal fold and increases the area for denture adaptation. The mucous membrane flap of the lip is then sutured to close the existing defect. (Fig. 14.) This is easily accomplished owing to the elastic character of mucous membrane. The raised mucobuccal fold is maintained in its new position during healing by suitable splinting, the most effective splint being the old denture with its labial rim built up to hold the tissues in the desired position.

The presence of fibrous bands extending between the cheek or lip and the mucous membrane covering the ridges tend to efface the mucobuccal folds, destroying the uniform contour of the sulcus. They occur as the result of trauma in which there has been injury to the soft tissues covering the ridge as well as to the lips or cheek. Frequent causes are crushing injuries from automobile and occupational accidents. Deep lacerations, especially if they extend entirely through the cheek or lip, heal with a hard indurated scar, and their repair should be deferred until the gradual abatement of the induration is complete. This may require several months. If the adhesion is not too wide, it can best be repaired by utilization of the Z-type incision already described. (Fig. 9.) For the more extensive adhesions, repair is best effected by the procedure described for removing hypertrophied tissue and extension of the mucobuccal fold in the upper anterior jaw. (Figs. 12-14.)

The use of Thiersch grafts has been advocated for the correction of broad extensive adhesions, but this method holds no advantage over those just described. Although this epidermal graft takes very readily in the mouth, even in the presence of infection, it undergoes considerable shrinkage and does not present the soft, smooth, pliable surface that can be obtained from utilizing normal mouth mucous membrane.

Atrophic changes of bone and soft tissue are frequently observed in both the upper and the lower jaw. Sites of predilection for soft tissue atrophy are the palatal surfaces of the upper jaw and the crest of the ridge of the mandible. An insufficiency of submucous tissue gives a hard and unyielding surface to withstand the pressure of functioning dentures. The usual complaint is that of a sore mouth made worse by attempted mastication. Examination elicits no abnormality of the mucous membrane other than its extreme thinness and blanched color. Considerable improvement is afforded these cases by lifting the mucoperiosteum from the bone in the affected area through a short incision suitably placed (Fig. 15), allowing for the formation of a blood clot that eventually organizes into submucous tissue.

Bones are usually regarded as very resistant structures, but the jaw bones are peculiarly liable to local as well as general atrophic change. In addition to the usual senile wasting of advanced years, local change is observed as the result of disease, impaired nutritional capacity and arrest of function.

Atrophy of the alveolar bone, regardless of the cause, frequently results in the formation of a sharp irregular crest of bone on the surface of the ridges. (Fig. 16.) This is most often observed in patients who have worn dentures for varying periods of time over ridges improperly prepared at the time of extraction or resorbed from the pressure of ill-fitting dentures. The soft tissues impinged upon between the denture and the sharp serrated ridge become tender and sore, and eventually there is an absolute loss of function. Relieving the denture over the area gives only temporary relief. Permanent relief is affected by incising the soft tissue along the crest of the ridge, removing the sharp crest of bone with rongeurs and smoothing the surface with a file. The flaps are closed loosely to allow for organization of blood

clot and an ultimate increase in thickness of the soft tissue over the ridge.

Another traumatic condition frequently observed wherein denture construction is impossible is acquired microstomia or atresia of the buccal orifice.[3] These abnormalities may be congenital, but more often they occur as a sequel of disease or injury. Lupus, noma, syphilis and epithelioma are contributing causes, but most frequently they occur as the result of burns. They may be so extensive as to prevent the introduction of solid food and may interfere with mastication and speech. In fact, in one case that came under my observation, dental work of any type was impossible owing to the minute size of the oral orifice. In minor cases, simple section of a band of scar tissue at the labial commissures may suffice. In pronounced cases in which a considerable amount of scar tissue is present, the angles of the mouth must be extended for satisfactory cosmetic and functional results.

To extend or enlarge a constricted mouth, the proper shape and extent are exactly determined (Fig. 17) with calipers, and a narrow quadrilateral flap of skin is removed from the corner of the constricted mouth opening. This flap contains the skin and subcutaneous tissue, but not the inner mucous membrane of the cheek. (Fig. 18.) After removal of the quadrilateral flap of skin, the underlying mucous membrane is divided horizontally so as to bisect the denuded area, and, at the outer end of the horizontal incision, a cut is made perpendicular to the first, but slightly convex medially. These incisions form three mucous membrane flaps, an upper, a lower and an external flap. The upper and lower flaps are sutured to the corresponding skin margins and the external flap is brought out to form the commissure. (Fig. 19.) This procedure gives an excellent cosmetic and functional result.

CONCLUSION

I do not wish to leave the impression that the abnormalities herein described cover all the oral defects that interfere with denture construction. They do, however, cover those most commonly seen and in which considerable benefit can accrue from properly planned and skilfully executed operations. Close cooperation between the prosthodontist and the dental surgeon is imperative for the best results from the efforts of each.

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Henry Ford Hospital.

ELIMINATION OF THE PERIODONTAL POCKET IN THE TREATMENT OF PYORRHEA

By Edgar D. Coolidge, M.S., D.D.S., Chicago, Ill.

THE purpose of the treatment of suppurating pockets is to check the suppuration and eliminate the pocket in which it exists. The disease is limited to the soft tissues and alveolar bone surrounding the root and is always cured when the tooth is extracted. It is the objective of the operator to check the disease and prevent its further spread to deeper tissues in order that the tooth may remain in function as long as possible without any harmful influence on general health or the local structures. The presence of infection and inflammation in the tissues of any part of the body subjects the whole body to an unnecessary danger from the absorption of infectious material. The treatment should be planned according to the etiologic factors. However, there is a definite routine procedure that applies to most conditions. Although there is much similarity in the pathology of suppurating pockets, the tissue response to treatment may not always be the same. Many times, the reaction or lack of reaction to certain treatment is an important aid in determining the etiologic factor. The usual steps in the treatment may be outlined as follows:

1. Examination, recording and treatment planning.
2. Routine treatment, which consists in scaling and polishing the surfaces of the teeth, stimulating the circulation in the gingival tissues and instructing the patient in home care of the teeth.
3. The removal or correction of all mechanical irritants.
4. The control of infection in the gingival crevices.
5. The correction of occlusal disharmony and the establishment of a gliding occlusion.
6. The removal of teeth that have insufficient support and cannot be stabilized to withstand masticating forces.
7. The elimination of all remaining pockets.
8. Fixation of teeth with mechanical support where stabilization is indicated.

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Read before the Section on Therapeutics, Pathology and Research at the Seventy-Fourth Annual Midwinter Meeting of the Chicago Dental Society, February 15, 1938.

EXAMINATION, RECORDING AND TREATMENT PLANNING

The careful and thorough examination of each case is the first step in successful treatment. All information relating to the condition of the teeth, the gingivae and soft tissues of the mouth and all data relating to the personal and family history should be included in a permanent record of each patient. The best time to record such information is before the treatment has been outlined, since it is the basis for rational treatment.

A comprehensive diagram for the recording of periodontal disease was suggested by G. V. Black,[1] with various numbers and symbols to indicate the

cause of the condition observed. Hirschfeld[2] has developed a system of diagrammatic recording using different symbols and markings to indicate every conceivable condition, in a simple but comprehensive manner. It is most important that a complete and accurate record be made of every case, and each operator can adapt some outline to fit his needs.

The time required for a detailed examination of each surface of each tooth for causes of irritation and for a careful exploration of the gingival crevice on each surface of each root for calculus and pocket formation will seldom be less than thirty minutes and is usually one hour. A complete set of roentgenograms should be at hand as a guide in the examination to help in determining the prognosis of the condition found around each tooth. The depth of pockets and, as nearly as can be determined, the cause of pocket formation should be recorded and teeth too badly involved should be indicated for extraction. The importance of studying the etiology cannot be overemphasized, since rational treatment is based upon the determination of the cause, a knowledge of the pathology and a familiarity of the operator with the tissue reaction to be expected from prescribed treatment.

Fig. 1.—A ute Vincent's infection in mouth of man aged 27; infection of superficial tissues only; no suppurating pockets.

Fig. 2.—Acute Vincent's infection in mouth of man aged 35; superimposed upon suppurating pockets.

All mechanical irritants, such as open contacts, food packs, rough margins and ill-fitting crowns, should be recorded. Calculus deposits should always be observed and their definite location recorded. This is especially important for subgingival calculus. Suspected infection should be indicated, to be identified by microscopic examination later. Evidence of occlusal disharmony and traumatic disturbance caused by excessive occlusal stress should be indicated. It is often necessary to take impressions and make plaster casts of the teeth for further study of their occlusal relations.

The case history is not complete without a record of the systemic conditions that may influence the diagnosis and plan of treatment. The diseases to which the patient has been subjected and the pathologic conditions existing in other organs and tissues should be discussed and recorded. The following questions are examples of the procedure that the writer has found helpful in bringing out desired information:

1. Are there any joint enlargements?
2. Are there painful muscles or joints?
3. Is the patient anemic?
4. Is the general health good, fair or poor?
5. Is there inflammation of the nose, throat or tonsils?
6. Have there been attacks of appen-

dicitis, ulcers of the stomach, gallbladder infection or other systemic conditions which might result from focal infection?

7. Is there complaint of nervousness or fatigue?

8. Has there been any pain which may be a reflex in the distribution of the fifth nerve or elsewhere?

9. What is the red cell count? white cell count? hemoglobin index?

The name and address of the physician from whom a report of a physical examination can be obtained are also noted.

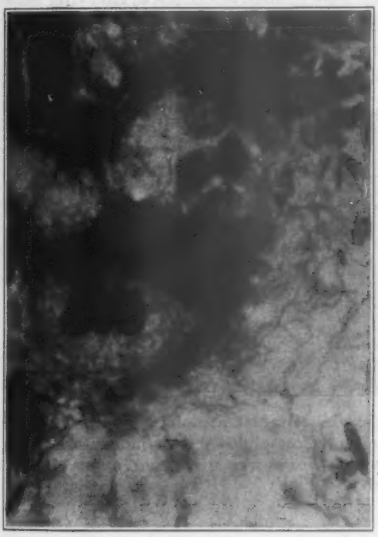

Fig. 3.—Mouth smear in acute Vincent's infection showing clump of fusiform organisms (F_1), and a few larger fusiform organisms (F_2). Many spirochetes appear in the background.

Treatment planning is necessary for success of the treatment. It should be determined at this time how many teeth can be properly treated at each appointment. This helps to form a mental picture of the whole plan and of the completed case toward which to work. It also helps to establish a basis for the amount of time, the number of appointments required and the approximate fee that should be asked for the service. By establishing a good working plan and making a business arrangement with the patient at this time, there is less opportunity for misunderstandings and disagreements as the work progresses.

ROUTINE TREATMENT

The routine treatment which is indicated in the control of suppurating pockets is merely the first step toward establishing a hygienic condition in the entire mouth. The x-ray negatives should be placed before the operator so as to be readily referred to, in order to check the position of pockets about the teeth during the process of treatment. Before the

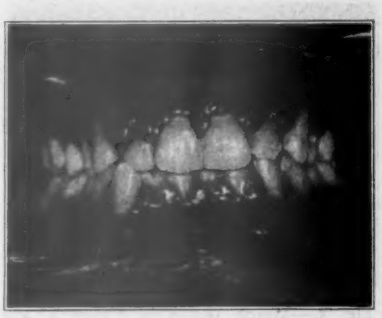

Fig. 4.—Hypertrophic gingivae of young woman after pregnancy. A microscopic smear revealed many Vincent organisms. (Photograph by Willman.)

dentist begins to operate, a careful, detailed examination of the gingival crevice on each surface of the tooth should be made and recorded on a diagram of the mouth, indicating the location and depth of the pockets to be treated. It is not good practice to distribute the treatment indiscriminately, a little here and a little there: each tooth in succession should be consistently and thoroughly filed and polished. By this plan, the injured soft tissues surrounding the teeth which have been scaled are confined to one portion of the mouth; which relieves

the patient of considerable discomfort in mastication, since a small injured area can be avoided in mastication.

The instruments needed for the treatment of suppurating pockets differ from those useful in removing calculus in prophylactic treatments in the one respect that it is necessary to have longer shanks to carry the blade or file into the deeper gingival crevices. Small files are especially indicated for this work, as they will fit the contour of the root surfaces with less injury and leave a smoother surface than the hoe type of instruments. Not only is it necessary to meticulously remove all of the calculus from the root surfaces, but also the cementum that is denuded and roughened should be filed or planed smooth before the treatment is completed. This must be done with care so that the dentin is not exposed by the removal of all cementum from the root surfaces. The exposure of dentin to the action of the saliva predisposes the tooth to caries, pulp irritation and the development of sensitive areas on the necks of teeth. It is impossible to eliminate suppurating pockets as long as there is calculus on the surface of the roots. The irritation from calculus is one of the principal factors in maintaining chronic gingivitis. Suppuration cannot be checked unless the cementum is smooth and free from all irritants to the overlying tissues.

By means of the explorer, the surface of the root is tested from time to time to locate particles of calculus or rough cementum and to determine when the surface of the root is smooth. When each surface of the root is smooth and well polished, most shallow pockets will disappear unless the cause has not as yet been removed. Polishing with the porte polisher and orangewood stick, carrying very fine pumice, whiting and tin oxide, is very important. The use of the porte polisher and wood point in polishing root surfaces is also an important factor in promoting the circulation of the gingival tissues. Scaling often causes considerable hemorrhage, and when it is followed by the use of the porte polisher, the tissue is compressed by gentle pressure until it clings to the root more closely.

While the routine procedure of scaling and polishing is going on, the patient may be instructed in home care and the technic of interdental brushing to assist in the necessary tissue stimulation. Sometimes, rubber tissue stimulators, wood points or round wooden toothpicks are

Fig. 5.—Mouth shown in Figure 4, after treatment. The gingivae of the upper teeth were treated with several applications of iodoglycerol followed by 10 per cent silver nitrate. The lower anterior gingivae were treated by electrocoagulation (Webb's Method). (Photograph by Willman.)

Fig. 6.—Alveolar atrophy; drifting incisors; premature loss of lower first molars and deep overbite; excessive stress on upper incisor teeth.

recommended, with which gentle pressure may be exerted on the soft tissue overlying the pocket. Stimulation at regular intervals in daily care of the teeth often hastens recovery. Much emphasis must be placed on the importance of home care by the patient. Most patients need instruction in proper methods of brushing the teeth, the type of brush indicated and the number of brushes that should be used. Few patients know how much time should be devoted to a mouth hygiene program. After the entire mouth has been covered by this routine treatment and a conscientious effort has been made in home care by the patient, it will be found that most suppurating pockets have disappeared, especially those that are caused by the presence of calculus.

Fig. 7.—Inlays joined together on lingual surface stabilizing incisors shown in Figure 6. (Courtesy of George G. Postels.)

REMOVAL OR CORRECTION OF OTHER LOCAL IRRITANTS

This part of the procedure can be combined with the first routine treatment or it can be carried out after the routine treatment has been completed. If inflammatory areas remain after routine treatment has been completed, it is evident that other irritants are responsible for the continuance of suppuration and marginal inflammation. On examination, these areas will frequently be found where inlays and fillings have not been properly finished, and it becomes necessary to remove all overhanging edges by means of files and sandpaper strips.

The crown made with a band has been condemned by many operators as a source of constant irritation. However, the banded crown is not at fault in itself, but rather the operator who is not able to apply it without its becoming a source of irritation to the tissues. It is often necessary to remove a crown and properly prepare the root, after which a smaller band can be made to fit the root accurately. Oftentimes, a band is found to extend too far beneath the free margin of the gum and it may be necessary to remove the crown and allow the tissue to heal in order to determine at what point the band should be fitted so that it will not cause chronic gingivitis.

Many times, the absence or poor location of contact points will permit packing of food between the teeth, and it may become necessary to remove an inlay or a filling in order to establish a firm contact point between two approximating teeth. Failure to reproduce the normal contour of a tooth may also be responsible for the packing of food between the teeth. A failure to establish a marginal ridge with the central grooves and sulci so located as to hold the food in position on the occlusal surface of the tooth may be responsible for the crowding of food between the teeth and wedging them apart. A contact that is too broad and does not permit a normally contoured approximating surface, but closes up the natural embrasure between the teeth, is also a frequent cause of food lodgement. It is important to correct the loss of contacts due to drifting and tipping where a tooth is missing by replacing missing teeth. Irritation and abnormal stress caused by removable appliances should be corrected. When this second step has been completed and the

mouth is freed from these mechanical irritants, many suppurating pockets will heal without further treatment.

CONTROL OF INFECTION

The control of infection in the gingival crevices is accomplished by two methods: (1) by increasing the resistance of the tissues in the removal of all mechanical irritants which are the cause of chronic gingivitis, and (2) by means of medication to assist the tissues in their fight against micro-organisms. Although the unbroken tissue does not as a rule become infected, the gingival tissues are constantly subjected to injury in the mastication of foods, and infection is an important factor in maintaining gingivitis, especially of the hemorrhagic type.

The types of organisms that are commonly found in the gingival crevices are many. A mouth smear should be made from crevices where persistent suppuration continues, to ascertain the type of organism in predominance, and treatment should be instituted for the control of the infection. Suppurating pockets will usually be found to contain masses of fusospirillary organisms that appear to be very similar to Vincent's organisms, and other types may be found. Although there may be no symptoms of an acute infection, the presence of great numbers of organisms of the Vincent type, cocci forms, different forms of leptothrix or amebae is usually an indication for specific medication.

The treatment as outlined for Vincent's infection will be found effective in the reduction of persistent suppuration. Although medication in itself seldom cures suppurating pockets and is of only temporary benefit when not accompanied by the two preceding steps in the treatment, it becomes an important factor in the control of persistent gingivitis and suppuration after the first two steps have been completed. The following solutions will be found effective in controlling mixed infections:

Fig. 8.—Plaster casts of dentures with disturbance of occlusion due to premature loss of lower first molars.

Solution phenyl mercuric nitrate 1/1500 120 cc.

Sig. Dilute with 3 parts of water and flush the mouth vigorously for 2 minutes.

Solution metaphen 1/2500 240 cc.

Sig. Dilute with equal parts of water and flush the mouth vigorously for 2 minutes.

The pockets, after thorough irrigation, may be dried and a 5 per cent arsphenamine solution in glycerin be applied with

a rubber cup medicator. This treatment is not only useful in the control of Vincent's organisms that may be rampant in the pocket, but will also be found effective against the different types of cocci, the leptothrix, amebae and other organisms that may be present. Treatment should be continued daily, supported by conscientious home care, until all bleeding, suppuration and inflammation have subsided.

CORRECTION OF OCCLUSAL DISHARMONY

A consideration of the development of occlusal disharmony and the resultant abnormal or excessive occlusal stress is not possible at this time. In the treatment of suppurating pockets, there may be as many difficulties encountered as there are factors responsible for the condition. As has been stated, the routine treatment corrects the largest percentage of suppurating pockets of a shallow character, whereas the removal or correction of other local irritants and the control of the infection which persists effects a cure in many more pockets. However, there are seldom two dentures of natural teeth in which there are no areas of cusp interference acting as contributing factors, if not the principal factors, in periodontal disturbances. Not only is it necessary to relieve certain areas, but often it is also found necessary to make restorations to establish more harmonious occlusal relations, to replace missing teeth or to open the bite. A simple case of occlusal disharmony may be relieved by grinding those areas that fail to wear down and prevent a smooth gliding occlusion.

Where high cusps and deep sulci are found or there is uneven wear of the occlusal surfaces, it is usually necessary to take impressions in modeling compound of each natural denture and make plaster casts for study. With the plaster casts and roentgenograms at hand, it is possible to study the intercusping relation of the teeth, and when the casts are mounted upon an articulator which permits movements similar to the natural movements of the jaw, the cusps that interfere with harmonious movement can be readily found and indicated with lead pencil on the plaster casts. The necessary correction to balance the occlusion can be determined after the interfering cusps are located with articulating paper, the operator referring frequently to the articulated models and making the adjustments by spot grinding or by restorations that are indicated.

Fig. 9.—Plaster casts of dentures shown in Figure 8 after occlusion has been restored by two inlays on lower left side and by inlay bridge on right side.

During the time of observation, many

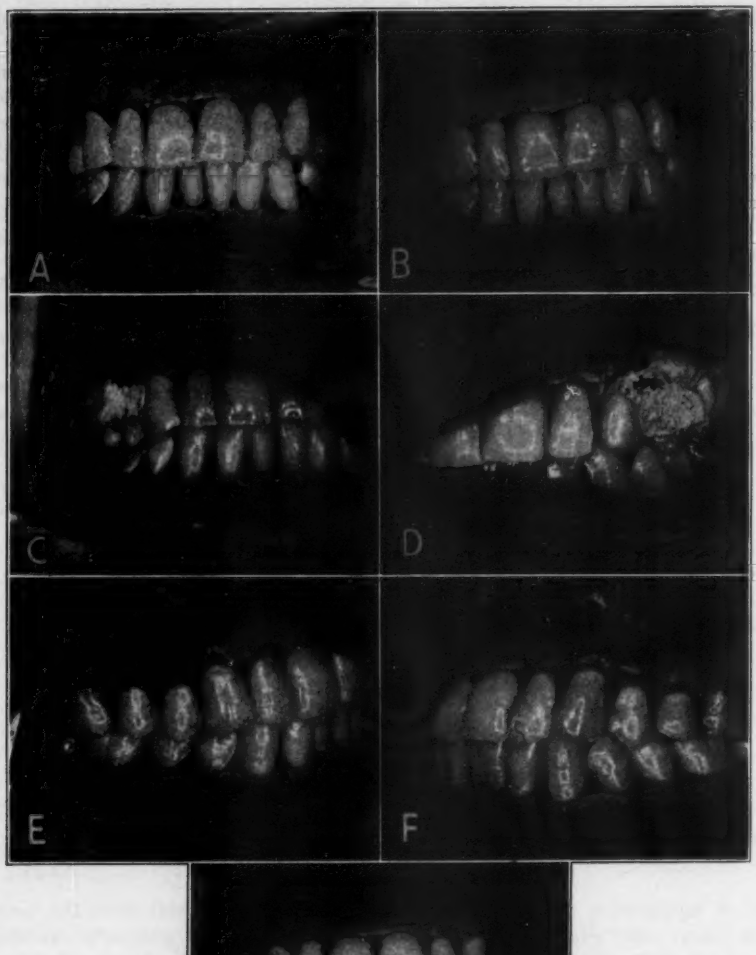

Fig. 10.—A: Teeth of woman aged 38, showing advanced pyorrhea. The roentgenograms reveal much loss of alveolar bone and deep pockets around the molars and bicuspids and between lateral incisors and cuspids in both dentures. B: Pockets around anterior teeth of each denture treated by electrocoagulation. C and D: Molars and bicuspids of upper denture after gum resection, showing surgical pack in place. E and F: Molar and bicuspid areas of each denture three months after gum resection, showing healing in progress. G: Completed case.

characteristic habits of the patient which are related to occlusal disharmony will be noted. Much of the abnormal and excessive occlusal stress may be found to be developed during sleep, and these habits can best be overcome by establishing a gliding, balanced occlusion. Spot grinding the natural teeth must be done with great caution. The disarticulation of one tooth is sure to bring additional stress on some other tooth in the denture, and if several teeth are disarticulated, there may, in a short time, be new evidence of abnormal and excessive stress.

Frequent checking is necessary to observe the effect of efforts to establish balanced occlusion, since the efforts are not always successful at first. A tooth once relieved may be found to be in malocclusion again soon after the correction has been made. All surfaces that have been ground with carborundum stone should be polished with fine cuttlefish disks. Sensitive areas appearing upon the surfaces of the teeth and resembling similar areas in hypersensitive dentin may be controlled readily with remedies indicated for treating hypersensitive dentin, such as zinc chloride or silver nitrate.

REMOVAL OF HOPELESSLY INVOLVED TEETH

It is not necessary to delay the removal of hopelessly involved teeth to this point in the treatment of suppurating pockets. Some teeth may be condemned on the first visit of the patient after the original examination and first diagnosis of the case. During the course of the treatment, it may develop that certain teeth which were retained with the hope that treatment would prove successful may now be found to have such a reduced capacity for masticating, because of the loss of support, that it is unwise to retain them longer. When pockets have developed that cannot be eliminated by the preceding treatment, and surgical treatment does not seem practical as a final resort, they should be extracted without further delay. Pockets that extend into the bifurcation, so that it is not possible to establish satisfactory drainage and self-cleansing by surgical means, can be corrected only by removal of the tooth.

ELIMINATION OF POCKETS

The cure for suppurating pyorrhea pockets is elimination of the pocket. Where the gingival crevice has become so deep that suppuration continues in spite of conservative treatment as outlined, it becomes necessary to resort to removal of the gingival tissue to a point where the attachment of the tissue to the tooth forms the bottom of the pocket. The undesirable mass of soft tissue surrounding the neck of the tooth and forming the pus pocket may be removed by caustic medication, by surgical removal or by electrocoagulation.

Caustic Medication.—While caustic medication is slow, there are indications for its use that are worthy of mention. When a strong iodine solution is carefully placed upon the surface of the dry hypertrophic gingival tissue and carried down into the depth of the pocket, suppurating pockets frequently will heal. The iodoglycerol solution recommended by Talbot is especially useful for this purpose:

Iodoglycerol solution	
Iodine crystals	20 gm.
Zinc iodide	12 gm.
Water	8 cc.
Glycerin	40 cc.

Sig. Iodoglycerol for office use.

The repeated application of this solution with an orangewood stick mounted in the porte polisher, with which a gentle but firm pressure is repeatedly brought to bear on the soft mass of gingival tissue, often will gradually reduce the tissue until the pocket is eliminated. Where a more severe caustic is necessary, this treatment may be followed by a 10 to 25

per cent solution of silver nitrate applied immediately upon the iodine solution and carried into the gingival crevices. Because of the caustic nature and the staining quality of the silver nitrate, extreme care must be used to prevent it from running down on the pliers and coming in contact with any other tissue. Where the surfaces of the teeth have been coated with the iodine solution, little silver stain will be found on the necks of the teeth. This treatment applies more to the bicuspid and molar regions than to the region of the anterior teeth and is especially indicated in the deep crevices around the distal surfaces of the second and third molars.

Finely powdered copper sulfate made into a paste with an 8 per cent solution of zinc chloride has also been recommended for caustic medication of suppurating pockets. In drug medication, it is important that the operator or patient shall not expect too much. Medication properly used is an important adjunct in the treatment, but will be found highly disappointing to one who does not apply drugs intelligently and fails to carry out the important steps that always should be followed.

Surgical Treatment.—The object of surgical treatment is to remove the gingival tissue that surrounds a pathologic pocket. The tissue is often hypertrophic and swollen and granulation tissue is usually found within the depth of the pocket. The inflamed tissue that envelops the pocket along the surface of the root and the rough, degenerated edges of alveolar bone must be removed so as to prevent the accumulation of pus and exudate in the crevice. When the loose overlying soft tissue that is not attached to the surface of the root is removed, the pocket is eliminated. New epithelium quickly spreads over the exposed surface and a new border of soft tissue is established with no gingival crevice.

Although the surgical removal of the gingival tissue is not new, it has not been common practice until recent years. Reference was made to surgical treatment for pyorrhea[3] by Bourdet in 1757 and by the early Americans: Woofendale in 1783; Longbotham in 1802; Horace Hayden in 1822, and Joseph Linderer in 1851.[4] John Riggs is said to have advocated a type of surgical treatment as early as 1840,[5] but the record of his own statements is somewhat disappointing. However, the statements of his contemporaries[6] confirm the credit that has been given him as the outstanding American dentist of his time to advocate the removal of the diseased tissue and affected bone around teeth afflicted with pus pockets. He treated three or four teeth at a time and was very meticulous in his effort to remove every particle of calculus and diseased tissue.[7] He spoke of his operation as a purely surgical method,[8] but did not mention cutting away the tissue with knives at that time. Because of his frequent discussions of this method of treating pyorrhea before dental gatherings, the name of Dr. Riggs became so well identified with the disease that for many years it was called Riggs' disease.

Black[9] described surgical treatment for suppurating pockets in 1915, and A. D. Black[10] and his associates have continued this treatment, which has grown in popularity since that time. It has now become one of the usual procedures in the treatment of suppurating pockets.

Surgical technic: The surgical treatment known as gum resection, or gingivectomy, may be described as follows: The roentgenograms are placed in a convenient and suitable stand for ready reference in determining the amount of bone that has been lost. An exploration of each pocket to be eliminated is carefully made with a blunt instrument. The depth of the pocket and the outline of the bone margin beneath the soft tissue to which the excavation must be made are

definitely ascertained before an incision is made. The number of teeth from around which the tissue is to be removed at one time should not exceed one quadrant of the mouth or the maxillary and mandibular teeth on one side. This permits the use of the opposite quadrants for mastication, an important consideration for the comfort of the patient. Surgical treatment is usually indicated after conservative methods have been applied to place the mouth in as healthy condition as possible before exposing the underlying tissue. By this procedure, less danger of postoperative infection is encountered where these preceding steps have been strictly followed out.

The mouth of the patient should be thoroughly sprayed or flushed with a strong antiseptic solution, such as a 1:2500 solution of metaphen or 1:6000 phenyl mercuric nitrate solution, or the official 3 per cent hydrogen dioxide solution. The tissue to be removed should be superficially anesthetized by a local anesthetic.

The operating tray should contain sterile equipment as follows:

One set of periodontal knives (two pairs) (Merrifield).
One ordinary gum lancet.
One narrow blade eye lancet.
One pair of small surgical scissors.
An artery forceps.
Tissue pliers.
Foil carriers.
Two large fissure burs.
A lip retractor.
A small bone drill.
Chisels.
Explorers, mouth mirrors, etc.
Sterile surgical sponges.
Cotton rolls for packing the mouth.

The mouth is packed with sterile gauze and an incision is made to establish a new gingival margin around the teeth on which the operation is to be performed. The peridental knife will sink into the tissue readily to the depth at which the alveolar bone will be found. The narrow lancet is especially useful for loosening the tissue attached to the alveolar crest in the interproximal area. The gingival tissue is loosened at one extremity of the region and held with the forceps while it is gradually dissected away from each tooth. The same procedure is followed on the opposite surface, so that buccal and lingual pockets will be freed from the mass of soft tissue that is undesirable. When the pocket is on the mesial or distal side of a tooth, the overlying tissue in the interproximal areas should be removed and the edges of the outer plate of bone on the buccal and lingual sides should be beveled to leave a convex surface between the teeth.

After thorough removal of all undesirable soft tissue and the roughened process, the cotton and gauze packs may be removed and the mouth thoroughly irrigated with a mild antiseptic solution. The exposed connective tissue should now be covered with a protective surgical dressing. Ward's surgical dressing[11] has been found very useful for this purpose. The formula as originally published consists principally of zinc oxide and white resin mixed with oil of cloves and olive oil to a stiff paste, which is packed in the interproximal spaces between the teeth so as to cover all wounded surfaces and lap upon the neck of the teeth, to which the dressing becomes firmly attached as it hardens. The dressing is left on the teeth for a week, during which time it is seldom necessary to give any postoperative treatment.

On the return of the patient at the end of a week, the remaining dressing may be removed, and the tissue will usually be found in a satisfactory state of repair. The necks of the teeth should be thoroughly polished with an orangewood point mounted in a porte polisher and the patient instructed to keep the surfaces well cleaned with the toothbrush and wood stimulator. If the teeth are kept free from calculus and other irri-

tating substances, the tissue will heal about the necks of the teeth, only a very shallow gingival crevice remaining. As soon as the patient is able to eat with comfort, other areas of the mouth can be treated in a similar manner, until the mouth is entirely free from suppurating pockets. Although the condition may be considered cured at the time of the operation, experience has taught that frequent prophylaxis is necessary at regular intervals and a program of thorough home care must be persistently followed to maintain the healthy condition of the gingivae that have been regenerated.

Electrosurgical Treatment.—Electrosurgery is the use of high frequency electric currents in cutting through living tissue for the destruction and removal of diseased tissue with a minimum of bleeding. There are three main divisions of electrosurgery; namely, electrodesiccation, electrocoagulation and electrosurgical cutting.

Electrodesiccation is the dehydration of living tissues by the passage of a high frequency electric current through them. This treatment is usually applied by means of a single electrode.

The electrocoagulation is brought about by passing a high frequency electric current through living tissue with sufficient intensity to boil the liquid elements and coagulate the protein of the tissue. It is usually accomplished with a bipolar electrode.

Electrosurgical cutting is accomplished by the surgical separation of tissue by high frequency electric current. This current may be applied by either a single or a double terminal. "The cutting current has a proper frequency and balance between voltage and amperage and is of such wave form as to concentrate the heat to a tiny area, severing the tissues ahead of the electrode so they fairly part in advance of the current-carrying instrument." (Burdick Corporation, 1935.)

Electrocoagulation is the most used of the electrosurgical methods. A rather wide variety of machines have been introduced during the past twenty-five years for the application of the electric current in treatment of diseased tissue. Dermatologists, urologists, proctologists and otolaryngologists have used electrical means of removing pathologic tissue for many years. On the basis of the success of electrosurgery in the treatment of hypertrophied turbinates, etc., G. F. Webb, of Kansas City, began a clinical study of the effects of electrocoagulation in the treatment of pyorrhea pockets. A result similar to that obtained by surgical removal of the pocket is accomplished by means of electrocoagulation. An electric current of high frequency is used through a microsurgical unit. The intensity of the current is controlled by a spark gap, with micrometer control. The current is introduced into the tissue by means of a bipolar silver electrode designed by Webb. The current is controlled by a foot switch attached to the surgical unit by means of a flexible cable.

Webb has described the technic as follows[12]:

> The objective is controlled coagulation in a very small area, which requires a current of very high frequency, and unusual refinement (micrometer) of control. The two-pronged electrode allows accurate management of coagulation, since coagulation takes place only between the two poles, or prongs, and in immediately adjacent areas. The danger of the mono-polar or single point electrode is in the ease with which a tooth may unintentionally be devitalized.
>
> The electrode points are put in contact with that portion of the gingival margin to be coagulated. Then the foot switch is pressed just long enough to bring about coagulation of the diseased tissue. The process is repeated until the tissue of each tooth being treated has been completely encircled at all pathological points.
>
> In order to eradicate the interproximal tissue, the points are adjusted so that they can be placed in position on each side of the gum papilla, and the process of coagula-

tion is repeated on both lingual and buccal surfaces until one is sure that all the diseased area has been reached. If the patient gives a history of sensitive teeth, the electrode is also used with both points in contact with the tooth proper.

Following this treatment, as soon as healing is started, a very thorough cleaning and polishing of the teeth should be given. The importance of this step cannot be overemphasized. The occlusion should be balanced and any faulty dentistry corrected at once, thereby reducing the excess strain placed on the individual teeth to compensate for the former loss of supporting structure.

Beatty[13] summarizes the advantages to be derived by electrocoagulation as follows:

I. ADVANTAGES VERSUS SURGERY

Infiltration or topical anesthesia sufficient —no nerve blocking. No bleeding, no swelling, no surgical shock, no electrical shock, no stitches, no clot to protect, little granulation, less sensitiveness of teeth, no packing, beneficial hyperemia follows. Minimum loss of tissue, no loss of bony tissue, favorable prognosis for deep or shallow lesions, ease of control, adaptability of electrodes, sterile operation, scaling at later appointment: (a) calculus deposits in view; (b) bifurcations accessible; (c) smooth stones, finishing burs and polishing agents usable, little pain during or after operation.

In my opinion, electrocoagulation has a place of importance in the treatment of the periodontal pocket. The simplicity of its application, lack of shock and lack of hemorrhage following the operation are factors that recommend its use. Many times, surgical treatment is indicated in simple pockets that are left without a cure because of the inconvenience of preparing for the operation or the reluctance of the patient to submit to this method. Pockets that can readily be cured are often neglected and, as a result, serious and extensive pyorrhea develops in a few years, which greatly reduces the capacity of the teeth to function and exposes the patient to the danger of infection through absorption of toxins. Electrocoagulation should readily eliminate small pockets and be useful in the treatment of most cases of suppurative marginal periodontitis or paradental pyorrhea. Much study and careful observation of a large number of cases are necessary to assure uniformly successful results.

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GENERAL CONSIDERATIONS OF THE PROBLEMS IN DENTISTRY FOR CHILDREN

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WHY do many men fail in operative dentistry for children? Fundamentally, the principles of cavity preparation in the deciduous and in the permanent teeth are the same. However, there are some variations with reference to the depth of the cavity. The question when to extract the deciduous teeth and similarly when to fill them presents a serious problem in diagnosis. The use of the space retainer and the judicious application of root-canal therapy in the deciduous and young permanent teeth warrant consideration and study by all the profession. It is at this time in the life of the child that the dentist can make or mar the dental arch.

The foregoing are only a few of the problems that confront the thinking general practitioner. It is evident that it will be impossible to cover all of the problems in this presentation. Therefore, the present effort will be limited to the preliminary examination and to a consideration of some of the factors in cavity preparation and space retention.

A complete examination record is one of the first requisites of success. The dental practitioner who singles out one tooth in the arch and fills or extracts it without due consideration of the mouth and the body as a whole certainly has not a sound conception of his professional duty. In making an examination of a child patient, one should record the age, the history of the offending tooth or teeth and surrounding structures, the general health at present and in the past, the relative occlusion, the habits and the diet. Some practitioners feel that the five, ten or more minutes necessary for such a complete examination is a waste of time. If these practitioners could only realize that the few minutes spent in this examination may mean the difference between happiness and despair for the patient, they would welcome the opportunity. A dentist assumes a tremendous responsibility when examining a child, in that his diagnosis and procedure may determine the efficiency of mastication throughout life, and, to some extent, the general development of the child and his oral hygiene habits and related conditions.

An inadequate examination is also economically unsound in that the dentist cannot possibly make an intelligent estimate as to the probable cost of the necessary work. A practitioner that will estimate five hours of professional service in a given case and then have to double the amount of time in completing a case certainly invites financial failure.

When a chart is completely filled out, I tell the patient and the parent that the examination is only partially complete. Fixott[1] states that between 25 and 45 per cent of incipient interproximal cavities is overlooked without the medium of the x-rays. One has only to take a few

Read before the Section on Children's Dentistry—Mouth Hygiene at the Seventy-Fourth Annual Midwinter Clinic of the Chicago Dental Society, February 17, 1938.

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bitewing x-ray films to be convinced of this statement. Following the use of the bitewing films as a minimum approach to an examination, full mouth roentgenograms are suggested to reveal early or late resorption of the deciduous roots, the congenital absence of some permanent teeth, the malposition of teeth and the presence of supernumerary teeth and cysts of varied origin, as well as localized infection, evidenced by the destruction of bone.

Following the examination, prophylaxis is suggested, unless other emergency

Fig. 1.—Use of disclosing solution. Half of the teeth are cleaned, and the other half are as at the beginning of the case. A 2 per cent mercurochrome solution was used as the disclosing agent.

treatment is required. A prophylaxis will do three things and the parent is so informed. First, it gives the operator an opportunity to gain the confidence of the child; secondly, it acquaints the young patient with many of the painless dental procedures, and, last but certainly not least, it cleans the teeth. Figure 1 illustrates the advantages of the use of a disclosing solution. When half of the teeth are cleaned, a 2 per cent solution of mercurochrome may be applied to the teeth with a bit of cotton and the mouth washed out. The effects and the results of a prophylaxis can thus be well demonstrated to the child and the parent. This also gives one a check on himself as to whether all surfaces have been thoroughly cleansed.

In cavity preparation, the most common failures are the interproximal and mesioclusodistal cavity. There is only one logical time to fill the interproximal cavity, and that is in its incipiency. In too many instances, there are pulp exposures where the marginal ridges have broken down. The average distance from the external interproximal area to the

Fig. 2.—Two proximal cavities in deciduous molars. The marginal ridges in these cases were firm and could not be detected with an explorer.

pulp is approximately 2 mm.; therefore, if one can find the beginnings of decay, the chances for success are much greater. Because of the usual flat contacts, the short occlusal gingival crown distances and the high interproximal gingival tissue, it is very difficult, often impossible, to find the initial decay. Figure 2 shows a good example of two proximating cavities wherein the marginal ridges are firm and the operator missed both cavities in the usual explorer examination.

In all operative procedures, the desire is to reduce the operating time, to cause the least amount of pain, and to assure

satisfactory results. One of the most efficient ways to enter an incipient interproximal cavity wherein the marginal ridge is sound is by the use of the knife-edged stone or disk. Figure 3 shows the position and application of the stone for the initial interproximal cut. This procedure enables one to approach the dentino-enamel junction, to extend the cavity to the desired gingival depth and to establish the buccal and lingual outlines in one single operation. Figure 4 illustrates the next step in the preparation of the axial wall in a cavity for an amalgam filling. A No. 557 fissure bur is inserted and the axial wall completed from the buccal to the lingual border. The ideal distance axially or toward the pulp is

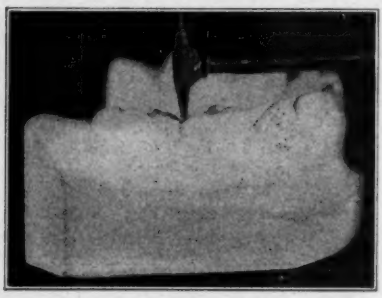

Fig. 3.—Use of Chayes No. 73 stone in initial cut of Class II cavity, wherein marginal ridge is not broken down.

the diameter of a No. 557 fissure bur, or 1 mm. It can be seen that a larger bur or one that was not under proper control would endanger the pulp. A handpiece that would allow 1 mm. of movement or play of a bur could certainly do much damage.

Figure 5 and 6 may clarify certain points in the axial preparation. Figure 5 (*a*) is an outline of an ideal Class II cavity. It should be noted that there are no sharp angles (little if any dovetail) from the occlusal to the interproximal surface. There is an even distribution of amalgam from the occlusal to the interproximal surface. It may be said that the "neck" of the cavity, that is, the area just above the axiopulpal line angle, should be nearly the interproximal width. One of the very common errors may be noted in the shaded (*b*) portion of Figure 5, representing an interproximal "wide-open" decay with the marginal ridge gone. It is necessary in these cases to extend the interproximal buccal and lingual margins. One of the common faults is the making of a pronounced dovetail on the occlusal surface and the retaining of a narrow "neck." The occlusal area should be widened so that its "neck" portion is nearly as wide as the area of proximal decay. In Figure 5 (*c*),

Fig. 4.—Ideal axial depth of Class II cavity; namely, 1 mm., made with No. 557 fissure bur.

the dotted outline illustrates the desired occlusal bulk. Figure 6 (B) shows the correct axial bulk necessary in the axiobuccal and the axiolingual line angles. Fillings inserted in cavities shaped as in Figure 5 (*b*) usually result in marginal fracture; whereas, in Figure 6 (B), the filling has an even distribution of bulk and will not fracture. The fact that there must be less depth in preparation in the deciduous tooth warrants one in utilizing every possible advantage.

The occlusal step is made with a No.

36 inverted cone bur and at a depth pulpally just beneath the dentino-enamel junction. The portion of the pulp most vulnerable to exposure through instrumentation is at the mesioclusal angle of the first two deciduous molars. If one uses precautions, particularly in these areas, and does not lower the pulpal wall beyond the above-described distance, pulp exposure will not be an operative factor.

The final step in the Class II preparation is to accentuate the axiolingual and

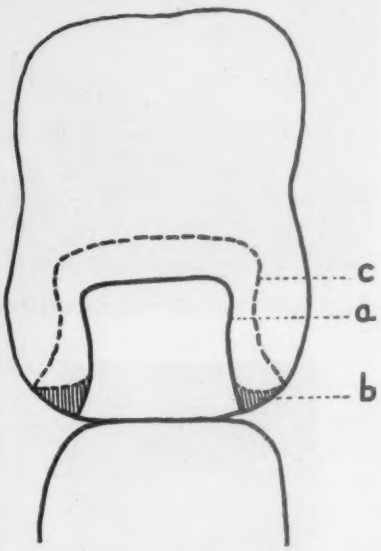

Fig. 5.—*a*, ideal cavity outline from occlusal to interproximal aspect. *b*, portion of amalgam that usually fractures in saucer-shaped cavity as in axial and narrow-necked occlusal areas. *c*, outline that should be prepared when marginal ridge is badly broken down and cavity is wide buccolingually.

the axiobuccal line angles with a No. 700 fissure bur. It may be noted at this time that there have been only three burs and one stone employed, which allows one to cut down the operating time to the minimum.

In cavities wherein the marginal ridge is broken down and decay is rampant, the first procedure is to remove all infected or soft decay. A No. 10 left and right spoon excavator is used to remove all of the leathery decay. If a hard, stained dentin remains without a pulp exposure, the area is painted with silver nitrate, and the axial wall built up with a sedative base. In the event of pulp exposure, the usual treatment is a partial pulpectomy.

The next step is the use of an efficient, economical and "fool-proof" matrix.

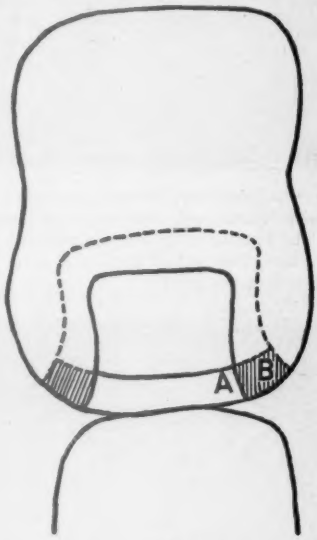

Fig. 6.—Proper depth of cavity at axiobuccal and axiolingual line angles. This depth should be uniform throughout the entire axial preparation; namely, 1 mm.

Such a matrix can be easily made by adapting about the tooth a steel matrix material 0.002 inch thick. A piece of material suitable in length is cut and adapted to the tooth, the loose ends in the buccal direction, as noted in Figure 7. Flat-nosed pliers are used to get an accurate measurement on the buccal surface. The matrix is then removed and one of the two buccal extensions is cut

approximately 1 mm. shorter than the other. The longer end is then folded over on the shorter end, and another fold is made, which will bring both ends up to the original measurement. The matrix is then placed on the tooth and the remaining buccal fold pressed flat to the tooth. The matrix can now be removed from the tooth and cut to the desired gingival and occlusal contour. Figure 8 shows the completed matrix on the tooth, and no reasonable amount of pressure can open the fold. This type of matrix can be made in approximately one minute and will obviate the use of the appliances that in the past have given so much trouble. It also allows one to place a cotton roll on the buccal surface in the upper arch, or on the buccal and lingual surfaces in the lower arch, to keep the cavity dry while the filling is being inserted. This matrix has also been found most satisfactory on the permanent teeth. I take no credit for originality, since this type of matrix, or at least a modification of it, has been in use for a number of years.

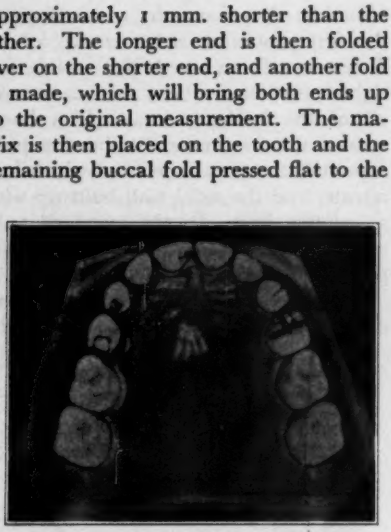

Fig. 7.—Initial step in preparation of matrix with 0.002 inch thickness steel matrix material. The buccal pinch is made with flat-nosed pliers. One end of the buccal loose ends is longer than the other.

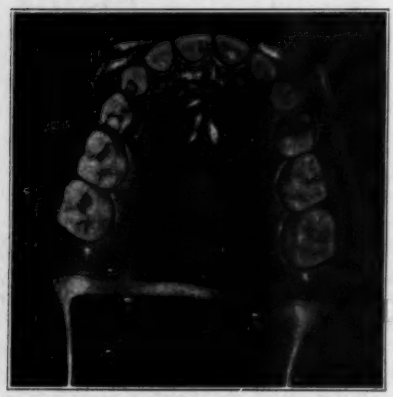

Fig. 8.—Completed matrix in place.

Fig. 9.—Two approximating Class II cavities.

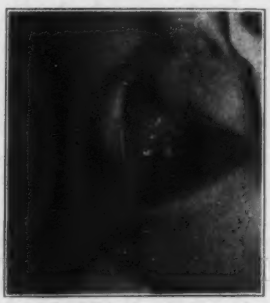

Fig. 10.—Partially erupted permanent molar with tissue flap over occlusal surface in process of eruption. These teeth should be carefully checked for cavities in the occlusal and buccal areas.

Figure 9 shows two approximating

Class II amalgam fillings in a child's mouth placed by a junior student. The placing of a finely contoured, serviceable Class II filling by a student should make the thinking man in the practice of dentistry today realize that, in the near future, preventive dentistry or dentistry for children will be on a par with adult dentistry. It will mean that children in every community will be able to receive a greater service. It is a pleasure to note the great number of dentists in practice today who welcome the opportunity of serving the child.

In dentistry for children, another phase of operative work is very much neglected; namely, the filling of pits and fissures. The first permanent molar, the importance of which need not be discussed, is the usual offender. The practice of prophylactic odontotomy is absolutely imperative for good operative procedure. If the finest explorer can enter a groove or pit, the removal of the defect and the insertion of a filling are warranted. Figure 10 presents a partially erupted permanent molar which has, in many instances, been severely neglected by the profession. The tissue flap above this occlusal area is loose and forms an

Fig. 11.—Fractured permanent anterior tooth wherein pulp is not exposed.

Fig. 12.—Model of case shown in Figure 11, with mesial and distal slices shown as made on fractured tooth in mouth.

Fig. 13.—Inlay investment model of fractured tooth in plaster built up to normal contour, and ready for the application of 30-gage wax.

Fig. 14.—Completed case (compare Figure 11), with synthetic porcelain in incisal one-third.

ideal incubator for bacteria, as well as a food trap. Several months sometimes pass before this tooth is completely erupted, and, in many instances, decay has progressed far into the dentin. A suitable explorer should be passed over the occlusal surface in the exposed area, as well as beneath the tissue flap, and every groove and pit should be tested. If the explorer catches, the tissue flap should be resected, a cavity prepared and a filling inserted. Many permanent teeth can be saved from gross destruction by such early treatment.

The Class III, or proximal, cavity in the deciduous anterior teeth presents another serious problem. If the life expectancy of a tooth with such a cavity is approximately six months or more, a cavity should be prepared and a silver amalgam filling inserted. The preparations should be approximately 1 mm. deep in the axial and pulpal areas. The mesial or distal portion is prepared with a No. 557 fissure bur and the lingual with a No. 36 inverted cone bur. The lingual "dovetail" affords a better approach to the axial area in closely contacting teeth. In the lower six anterior teeth, the "dovetail" is made on the labial aspect. The credit for this type of preparation in the deciduous teeth belongs to Charles A. Sweet, of Oakland, Calif.

One of the greatest operative problems of the profession today is the proximal method of preparing cavities in young permanent anterior teeth. The child, aged 8 to 10, with anterior interproximal decay presents a serious problem. Cement may be placed, but this filling serves only a short tenure of service. The silicates recommended by many are of doubtful value in the larger interproximal cavities and are limited in use. One of the most satisfactory fillings has been the interproximal inlay. The lingual "dovetail" cavity preparation is no doubt familiar to most practitioners. The axial depth is that of a No. 702 tapering fissure bur, which allows the formation of a correct lingual slope at the interproximal-gingival margin for the withdrawal of the wax. The lingual portion is prepared with a No. 36 inverted cone bur followed by a fissure bur to remove the undercuts.

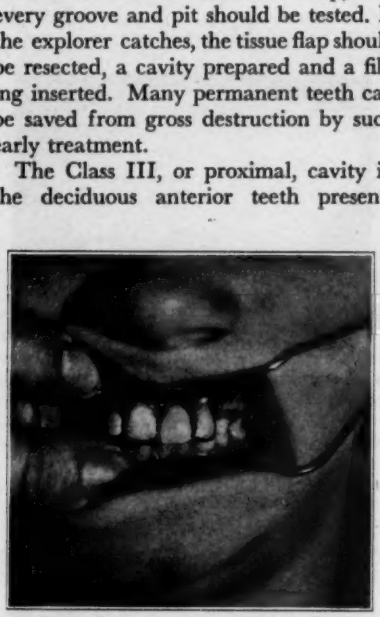

Fig. 15.—Anterior space retainer replacing lost permanent central incisor. The adjacent central and lateral incisor have the three-quarter basket crown castings with hard spring clasp gold, and a Steele facing and backing are attached. The patient was 10 years old.

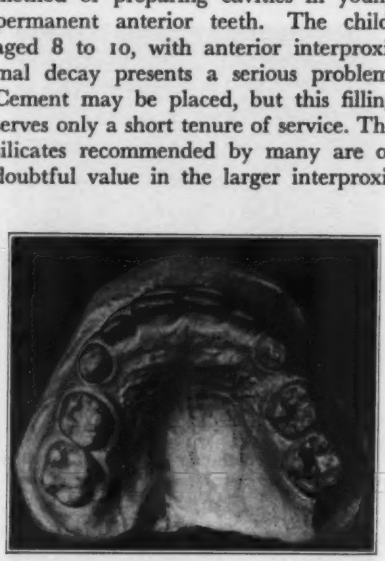

Fig. 16.—Closure of space in upper first deciduous molar region due to early extraction. The patient was 8 years old and the teeth were removed a year ago.

Another common operative problem in the anterior part of the mouth of young children is the fractured permanent anterior tooth. It is impossible to consider the many operative problems and the treatment of all classes of fracture in this paper, but I wish to present one method of treatment that has proved very satisfactory. In a fracture such as that shown in Figure 11, wherein the pulp is not exposed, and a sufficient amount of tooth structure has been lost to warrant restoration, the procedure is as follows.

Immediately after a fracture, it is a good plan to place a sedative paste over the fractured area, holding it in position by means of a celluloid crown. This is a temporary measure. A roentgenogram is always taken to note whether there is any root fracture, or any other subgingival disturbance. In from ten days to two weeks, if the tooth is comfortable and reacts normally to vitality tests, a permanent restoration may be planned. It is impractical, at this age, with the non-receded pulps, to consider full porcelain jacket preparations. A restoration that proves efficient in mastication and meets the esthetic requirement reasonably well is desirable.

The first step in such a preparation is a slice on the mesial and distal surfaces of sufficient thickness to allow the use of 30-gage wax. If there is occlusion with the lower teeth, sufficient lingual enamel is removed to accommodate a 30-gage wax. An impression is taken of the prepared tooth with compound in a copper band. This impression is poured in regular inlay investment. Another impression is taken in compound with a crown and bridge tray from cuspid to cuspid regions. The original fractured tooth investment model is then secured by separation, and inserted in the cuspid to cuspid impression and poured in plaster. Figure 12 shows this model and the mesial and distal preparation. Figure 13 shows this fractured investment tooth built up to its original length. A 30-gage wax is now adapted lingually and interproximally and according to the lines as marked on the labial area. This waxed tooth is now removed from the model and the casting is made direct to it. A hard spring clasp gold is used for casting. Figure 14 is the completed case with the synthetic porcelain inserted in the incisal third.

Fig. 17.—Investment cast with 30-gage wax adapted to abutment teeth. The additional layer of wax at the gingival area aids in the casting of this area.

Fig. 18.—Overlay on second deciduous molar to which is soldered round tube that will admit 0.040 wire.

Many times, a child aged 10 to 12 years has a fractured permanent anterior tooth which it is necessary to extract. In this type of case (Figure 15), the two teeth adjacent to the space can be treated in the same manner as the fractured tooth. A three-quarter spring clasp

basket crown is made for each, and a Steele backing soldered to the two attachments. The facing can then be placed. This functional space retainer can be worn until the age of 16 or 17 years. The girl in this case was 10 years of age.

Another much neglected procedure in the average dental office is space retention. Figure 16 shows a child aged 8 who had had both upper first deciduous molars removed approximately a year previously. How many dentists today tell patients and their parents that the deciduous tooth which they are extracting will not have a permanent successor in its place for a given number of years, and also that in the majority of instances

Fig. 19.—Overlay on deciduous cuspid, to which is soldered 0.040 wire.

the space closes? Deciduous teeth with parietal or periapical infection, as well as those with decay extending into the pulp bifurcation, must be extracted. An infected tooth is just as dangerous with reference to infecting the heart and other vital organs as is the diseased tonsil.

If this case in Figure 16 had been yours, and the teeth had been extracted a year ago and the patient was returning to the office for an examination, what would you tell him? Does the average dentist confess to his patients and their parents that he should have recommended a space retainer? Is he going to say, "Now, Mrs. Smith, these spaces have closed and it will require orthodontic treatment to reopen them"? These are a few of the problems for consideration in dentistry for children. What would happen if this child were examined by another dentist and the second dentist should tell that patient the truth?

In space retention, there are a few fundamental factors that should be considered. Growth and development should not be interfered with by a retainer. The ideal retainer should afford some occlusal surface to the opposite tooth, as well as maintain space.

Regarding the average lateral growth in the upper arch, Lewis and Lehman[2] write:

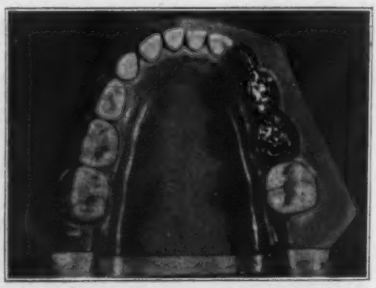

Fig. 20.—Completed case. The tube and wire at the posterior attachment will allow for full lateral growth in the cuspid area. The occlusal surface on the pontic is to be noted.

The greatest mean width increase in deciduous dental arches appears between the ages of six and eight and a half years and is greatest in the upper canine region. The total mean increase in the upper canine region is 5.25 mm. as compared to 2.40 mm. in the lower canine region. The total mean increase for the upper first molar region is 3.06 mm. as compared with 1.27 mm. in the lower first molar region. The total mean increase in the upper second molar region is 1.90 mm. as compared with 2.12 mm. in the lower second molar.

Another factor to be noted and one of major importance in the construction of a retainer is the distance from the dis-

tal surface of the second deciduous molar to the mesial surface of the deciduous cuspid, as compared with that of their successors. The distance is 1.2 mm. greater in the upper deciduous arch and 1.7 mm. in the lower arch. Nature planned that the posterior deciduous teeth should be larger, to allow for the normal mesial drifting of the first permanent molar while the permanent bicuspid teeth are being erupted. It also allows the permanent cuspid, which is wider than the deciduous cuspid, to have adequate room. No expansion takes place anteroposteriorly or is necessary in the posterior deciduous teeth.

In the preparation of the teeth adjacent to the space, little instrumentation is needed. The teeth are prepared to receive the Willett overlays. All points of contact with adjacent teeth are disked sufficiently to allow a 30-gage wax to be placed on the interproximal space. On a very short-crowned deciduous tooth, a groove is cut on the lingual, occlusal and buccal surfaces through the enamel, with a knife-edged stone. This affords additional retention where necessary.

The next step is to obtain a good impression by the corrected compound method, or compound "denticoll" combination. Two impressions of the same area are taken, one to be poured in an inlay investment and the other in stone. A bite is also obtained, as is the usual procedure for a bridge, and is used in mounting the stone cast. Figure 17 shows the investment cast with a 30-gage wax adapted to the two abutment teeth. The gingival area of wax is slightly thickened to allow for greater ease in casting. The wax having been adapted, the investment model is cut to allow for insertion of the sprue in each section, and cast separately. The casting is made of hard spring clasp gold.

Figure 18 shows the overlay on the second deciduous molar. To the overlay is soldered a round tube of the size that will admit a 0.040 wire. Figure 19 is a cuspid overlay to which has been soldered a 0.040 wire. Figure 20 shows the completed case. The occlusal wire not only aids in retaining the space mesiodistally, but also prevents the elongation of the upper deciduous teeth. If one desires to further increase the usefulness of this retainer, it is a very simple matter to adapt inlay wax about the wire and make a functional occlusion as is noted in this case.

The round tube and post are utilized in the posterior attachment to allow for a greater lateral growth in the cuspid

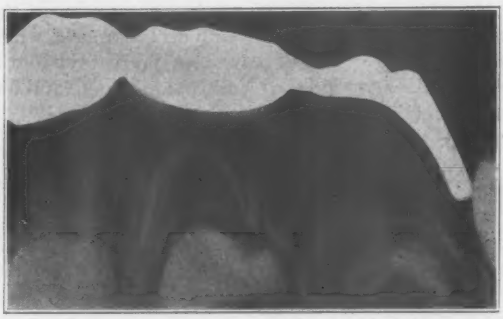

Fig. 21.—Case of boy aged 4½ wherein functional retainer was employed. The space was not only retained, but the boy also enjoyed an appreciable occlusion.

area. The cuspid is, therefore, in no way stabilized as is the case in many other types of retainers.

The actual cost of materials and the time of construction is much less than for the usual bridgework. The statement has been made many times that the dentist cannot get a sufficient fee for children's work in his community and that his patients do not want that kind of service. But has the dentist given his patients the complete story of what will probably happen to the space? Have the parents been informed that the child will in all probability have to wear orthodontic appliances to restore the space, or otherwise suffer a malocclusion, with its many sequelae? The least that any dentist can do is to inform patients and the parents of patients of all the potentialities in a given mouth.

Another type of retainer is designed by R. C. Willett to retain the second deciduous molar space before the eruption of the first permanent molar. Many times, it is necessary to extract a second deciduous molar at 4 or 5 years of age, and, in that instance, the first permanent molar moves into the space, thus "pocketing" the second bicuspid. It is best in these cases to first construct the retainer and then extract the tooth, thus allowing the shoe extension to be inserted just mesially to the unerupted first permanent molar. The only necessary preparation on the abutment teeth is relief of contact, and, in all of these cases, a groove is made with a knife-edged stone on the buccal, lingual and occlusal surfaces. A corrected compound impression is then taken and the case is waxed and cast in one piece. Figure 21 is a roentgenogram from a case of a boy aged 4½ years wearing this type of retainer. The distance distally for the shoe extension, and the question how far below the gingival line it should go will be determined by the measurements made from the roentgenograms. The distance from the distal surface of the first deciduous molar to the mesial surface of the first permanent molar is measured in millimeters and the wax pontic carved accordingly. It will also be noted that an occlusal area has been obtained from the bite on the articulator. The first permanent molar in this way is guided into occlusion, and when it finally erupts, an overlay is prepared for it. Space can thus be retained, and also function, to an appreciable degree.

Dentistry for children is not alone for the specialist, for there are thousands of communities in which there are no specialists. The general practitioner in the majority of cases will be the only source of service for the child, and it is with this thought that this material is presented.

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RESEARCH ON THE FLOW OF DENTAL AMALGAM

By E. W. Skinner,* Ph.D., Chicago, Ill.

OF all the materials employed in dentistry, probably amalgams offer the most complicated picture from a metallurgic viewpoint. In spite of the fact that the use of dental amalgam as a restorative material is very wide and generally successful, many gaps still exist in the knowledge of its processes of hardening, and their consequent influence on methods of manipulation. A large majority of the studies published on this subject have been concerned with dimensional change. Concentration on this one property at the expense of others, notably flow, is likely to be misleading. In the present research, an attempt is made to study the phenomenon of flow in connection with a few of the variables encountered in dental practice.

Flow is supposed to be manifested clinically by the disappearance of contact points, causing gingival overhangs, and perhaps the fracturing of occlusal margins, all of which occur after a considerable period of use. Certain authorities[1] do not consider flow to be a factor if modern alloys are employed; whereas others[2] are of the opinion that this property is a very important factor.

LABORATORY TESTS

The usual method for measuring the flow of amalgam is that described in the A.D.A. Specification No. 1 for Dental Amalgam alloys.[3] A cylindrical specimen 0.1575 inch (4 mm.) in diameter, and 0.3150 inch (8 mm.) in height is subjected to a static load of approximately 69 pounds† (3,550 pounds per square inch). The specimen is prepared according to the directions furnished by the manufacturer of the alloy under test. The test is started three hours after condensation and is prolonged for twenty-four hours at a temperature between 20° C. (68° F.) and 25° C. (77° F.). If the specimen exhibits a shortening (or flow) of more than 4 per cent of its length during the period of test, it is rejected for certification.

Presumably, the clinical interpretation of this test is that any amalgam which exhibits a flow of 4 per cent or less will be at least satisfactory as regards flow when employed in the mouth. Furthermore, all investigators, including myself, tacitly assume that the less this flow, the more resistant the amalgam to plastic distortion in the tooth. However, in the making of such assumptions, two weaknesses must be recognized: (1) the testing conditions set up are purely arbitrary as to the amount of the load and the length of the test, and (2) a static load is employed. The forces to which the amalgam is subjected in the mouth are not of a static nature, but rather are dynamic forces of impact and shear. It is not definitely known at the present time whether the actions of these two types of forces in this connection are even analogous. Consequently, laboratory data on this subject should be accepted as final only after they have been verified by clinical observations.

Read before the Section on Therapeutics, Pathology and Research at the Seventy-Fourth Annual Midwinter Meeting of the Chicago Dental Society, February 16, 1938.

*Associate professor of physics, Northwestern University Dental School.

†The exact figure is 250 kg. per square centimeter.

REVIEW OF THE LITERATURE

As far as is known, the first flow tests on dental amalgams were made by G. V. Black,[4] who employed a load of 60 pounds on a cube of 0.085 inch linear dimension for varying lengths of time. He compared the flow of pure silver, tin and amalgam, and found that the silver completely strain-hardened; whereas neither the tin nor the amalgam exhibited this property[7] to the same extent as the silver. This fact has since been verified by Ward and Scott.[6] They also demonstrated the effect of condensation pressure and trituration time[5] on flow.

The investigations on flow carried out at the National Bureau of Standards have already been mentioned.

Worner[8] has carried out an extensive investigation on flow of amalgams. He applied various loads by means of a lever, a method which is open to criticism as regards constancy of load, since no attempt was made to keep the lever arm constant in position. He found that the flow was greater at 37° C. than at room temperature. He also measured differences in flow of various amalgams when the test was begun at various time intervals measured from the time of trituration. He believes that differences in flow determined under these conditions can be partly accounted for by strain-hardening.

METHODS AND RESULTS

1. *Testing Considerations.*—At the outset, it was found that two factors, manipulation and temperature, must be accurately controlled, if results were to repeat themselves with a precision which would warrant drawing conclusions with any degree of certainty.

The flow test was found to be very sensitive as regards temperature changes, and, as a result, a constant temperature chamber was devised which could be held at 37° C. ±1 degree C. (98.6° F.). This temperature was chosen arbitrarily, not only because it is body temperature, but also because it was higher than any room temperatures likely to be encountered during the summer months. In this manner, any necessity for cooling would be avoided. All determinations were made at this temperature, and consequently the method does not entirely conform to the requirements of the American Dental Association Specification No. 1, although the same testing equipment was used as prescribed by this specification. Some idea of the difference in flow incurred may be obtained from Figure 1.

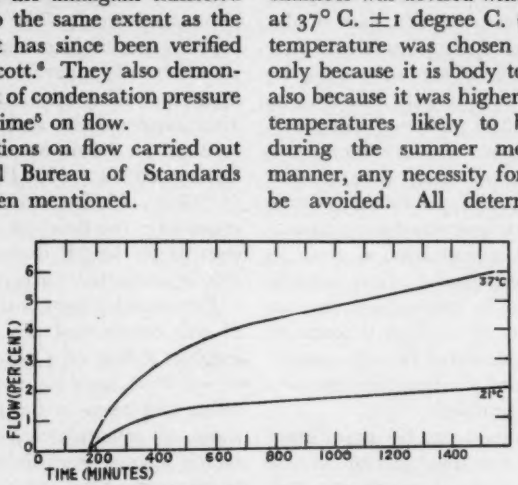

Fig. 1.—Effect of temperature on flow.

As may be noted, the flow is greater at the higher temperature. This increase in flow proportionately increased the experimental errors due to manipulative variables, especially variables incurred by condensation in the ordinary manner. Consequently, all condensation was carried out by machine. The entire mass of amalgam was inserted in the die, and was maintained under the desired load for

three minutes. The other manipulative errors were held to a minimum by accurate timing of trituration and palming. A light pressure was exerted on the pestle, which was ground to fit the mortar with carborundum powder. One gram of alloy was mixed with 1.6 gm. of mercury in all tests. Dental mercury that was guaranteed to meet the American Dental Association Specification No. 6 was employed throughout. All manipulative procedures were carried out at room temperature, after which the specimens were held at 37°C. (98.6°F.) until tested, unless otherwise noted.

Although it is well known that alloy composition is a potent factor in the control of flow, it was thought best to eliminate this factor in the present study since the primary object of the research was to obtain detailed information as to the nature of flow, and the manner in which it is influenced by certain manipulative procedures, rather than to compare various commercial products. The effect of composition has been left for future study. The alloy selected had the following composition by weight: silver, 68.8 per cent; tin, 26.8 per cent, and copper, 4.4 per cent. This particular alloy was selected because of the absence of zinc. It is hoped that some of the data obtained may eventually be related to the metallographic studies of Gayler,[9] who studied the constitution of amalgams of this nature in detail.

2. *Constant Flow.*—Figure 2 shows a typical flow curve obtained over a twenty-four-hour period. Extension of the data beyond the twenty-four-hour period gives little additional information concerning this alloy. The flow merely continues along the straight line, and becomes larger in proportion to the time elapsed. It should eventually depart from the straight line, but even a two weeks' determination shows only a negligible deviation in most cases.

In Figure 2, it may be noted that the flow becomes constant in rate only after several hours have elapsed. Hereafter, the term "constant flow" will be applied to the amount of flow which would occur if the straight line intersected the origin or point of zero time. The term "total flow" will be used to designate the flow as ordinarily measured. The constant flow is computed for any period of time by extending the straight line to the vertical axis and subtracting the value of the flow intercepted from the total flow.

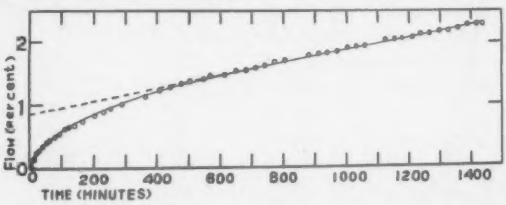

Fig. 2.—Typical curve for flow. The straight line portion of the curve has been extended along the dotted line to the vertical axis. The "total flow" is the total amount of flow which occurs in twenty-four hours. The "constant flow" is the total flow minus the amount of flow indicated by the intersection of the dotted line with the vertical axis. For example, in the graph shown, the total flow is 2.31 per cent and the constant flow is 2.31—0.65=1.66 per cent.

3. *Influence of Condensation Pressure.*—All specimens were triturated for one minute in the mortar, with 170 revolutions of the pestle under light pressure; after which they were palmed 100 times over a period of two minutes. They were condensed under the various pressures as described above. All tests were started three hours after condensation.

The results are shown in Figure 3 and Table 1. As may be noted, the constant

flow approaches and becomes proportional to the total flow only at the higher condensation pressures. Although the condensation pressures were carried far beyond the range of dental practice, the flow shows no evidence of ever becoming zero.

4. *Influence of Trituration.*—Two different methods of trituration were employed. In one series, the time of mortar trituration was held constant at one minute with 170 revolutions of the pestle, and the number of palming strokes were varied. In the other series, the mass was palmed twenty times, and the time of mortar trituration was varied. The rate of mortar trituration (i. e., 170 revolutions per minute) was held constant. All specimens were condensed under a pressure of 10,300 pounds per square inch, and otherwise handled as in the previous test. The results are shown in Figure 4 and Table 2.

The data for constant flow are rather erratic, but when the average curves are drawn, it may be noted from Figure 4 that the constant flow and the total flow are in nearly the same proportion in every case.

5. *Influence of Aging.*—Tests for the influence of elapsed time between trituration and the beginning of a flow test proved rather lengthy when the specimens were kept at room temperature. In fact, trials over a period of a year with this alloy failed to give a minimum and constant flow value. It was assumed that this phenomenon was linked in some manner with a condition of equilibrium between the mercury and the alloy, and that an aging at a higher temperature might accelerate the homogenization, if

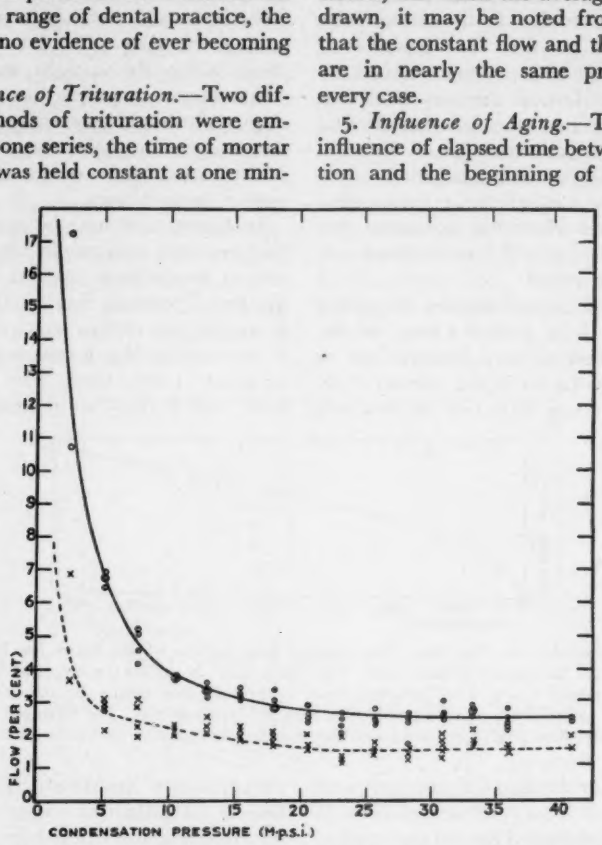

Fig. 3.—Influence of condensation pressure on flow. The solid line curve is for the total flow, and the broken line curve indicates the same effect for the constant flow.

it were a factor. Gayler[9] has shown that no transformation occurs in this amalgam between -36°C. (-33°F.) and 80°C. (176°F.). An arbitrary temperature of 60°C. (140°F.) was selected for the aging of amalgam specimens, which were triturated for four minutes in the mortar, palmed twenty times and condensed at a pressure of 10,300 pounds per square inch. The flow was determined for various aging periods. The results are given in Figure 5 and Table 3.

As may be noted from Figure 5, approximately three months was required to age the specimens to the extent that the flow did not change on further aging.

TABLE 1.—EFFECT OF CONDENSATION PRESSURE ON FLOW

Condensation Pressure (Lb. per Sq. In.)	Average Flow in 24 Hours: Constant Flow (Per Cent)	Average Flow in 24 Hours: Total Flow (Per Cent)
0		
2,600	5.25	13.96
5,100	2.74	6.50
7,700	2.50	4.76
10,300	2.20	3.74
12,800	2.28	3.37
15,400	2.06	3.22
18,000	1.93	3.02
20,500	1.73	2.56
23,100	1.41	2.34
25,700	1.56	2.47
28,200	1.44	2.56
30,800	1.56	2.58
33,400	1.77	2.69
36,900	1.46	2.35
41,000	1.63	2.35

COMMENT

Little reliable information is available concerning the exact nature of the complete process of hardening in an amalgam. In brief, it is thought that the mercury reacts with the alloy to produce complicated phases of different types. Probably, the filings are not completely dissolved by the mercury, and the reactions may continue for some time at mouth temperature before equilibrium is approached. As the tests are not started until three hours after trituration, it is unnecessary to consider the initial reactions, which are of considerable importance in connection with tests for dimensional change.

The initial curved portion of the flow curve (Fig. 2) may be due to at least two conditions: (1) a general decrease in plasticity due to a continuation of the hardening process and (2) possible inhomogeneities incurred during condensation. Both of these are gradually balanced, and the plasticity becomes nearly constant, as evidenced by the straight line portion of the curve. However, this theory does not rule out the possibility of a partial strain-hardening.

The fact has been fairly well established that the more mercury left in the amalgam after condensation, the slower the hardening process. This is demonstrated in part by the flow curves obtained with increase in condensation pressure. These curves showed a greater tendency to flow at a constant rate at an earlier period as the condensation pressure was increased. However, neither the constant flow nor the total flow which resulted from the highest condensation pressures (Fig. 3) were so low as the values found after aging (Fig. 5), even though the latter were condensed under a comparatively low pressure.

This relation between minimum flow under increased condensation pressure and aging at 60°C. (140°F.) may possibly be explained by two interdependent conditions which were brought about by the aging process: The amalgam was undoubtedly homogenized and brought nearer to equilibrium. In other words, the reactions between the residual mercury and alloy were carried to completion, and an atomic diffusion took place, both of which rendered the amalgam more homogeneous throughout. High condensation pressures would aid in the

prevention of mercury segregation, but any hastening of the hardening rate would be dependent mainly on the fact that there is less mercury to react. On this basis, it seems that the former point would be of more importance in connection with condensation pressure than the latter one of increasing the reaction rate. A third factor which must not be overlooked in connection with condensation pressures is the wedging of the alloy particles under high pressure.

Homogeneity of the amalgam as a factor in both strength and flow has not been emphasized in late years. G. V. Black[10] recognized this factor. He found that he had to exercise great care to insure that the mercury was evenly distributed throughout his specimens during condensation, in order to control flow tests. In other words, a single region which contains an excess of mercury will be a source of weakness for the entire mass, owing to the plasticity of the amalgam. The mercury diffuses slowly, and consequently the region will harden more slowly than the remainder of the mass. In the present research, with more delicate instruments, it was virtually impossible to obtain the desired degree of precision without resorting to condensation by machine. The clinical application of this principle is that the dentist should not only use heavy condensation pressure, but should also employ a uniform technic of condensation, so as to distribute the residual mercury throughout the mass as uniformly as possible. On this basis, a burnishing of the mass would seem to be contraindicated, as it might carry the mercury to the periphery of the filling, the area where strength is most desired.

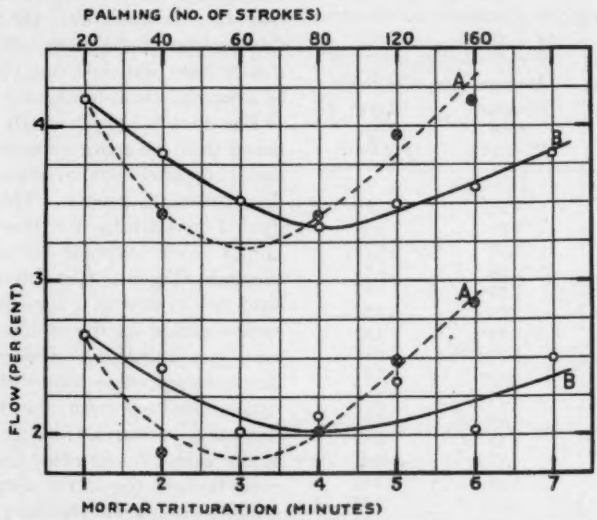

Fig. 4.—Effect of trituration on flow. The lower two curves are for constant flow. Curves A, mortar trituration held constant at one minute, 170. Curves B, palming held constant at 20 strokes.

On the basis of the foregoing, it may be noted that the flow test proposed by the American Dental Association Research Commission is not only a test for flow, but also a test for hardening rate and condensation ability of the alloy. For example, an amalgam might exhibit

a property of constant flow which is satisfactory, but if it hardens so slowly that it reaches a constant rate of flow after too long a period, it will exhibit a total flow of more than 4 per cent in twenty-four hours. Also, if the shape of the particles are such that they trap mercury too readily, the alloy may also be rejected for certification. If the dentist chooses alloys which meet this specification, he is thus protected on three counts in regard to flow, and there are not likely to be any loopholes.

Although in the specification for amalgams no direct account has been taken of the property of constant flow, it is of considerable importance, as may be shown from a study of Figure 3. In obtaining these data, it must be remembered that the amalgam was condensed in a single mass under a uniform pressure that was to some degree hydrostatic. In dental practice, the condenser point must be moved from one portion of the surface of the amalgam to another, which compresses the mass only in single regions at a time, and the total degree and homogeneity of the finally condensed filling must depend largely on the skill of the operator. Consequently, in order to estimate his condensation pressure in pounds per square inch, the dentist must condense a flow specimen under a measured thrust in pounds and test its flow, and compare it with a graph similar to that in Figure 3. This procedure is in accordance with that of Gray for equivalent crushing strengths of amalgam. As with Gray's curves for crushing strength, an empiric formula can be formulated for the flow curve.*

TABLE 2.—EFFECT OF TRITURATION ON FLOW

Time in Mortar (Minutes)	Palming (No. of Strokes)	Flow in 24 Hours: Constant Flow (Per Cent)	Flow in 24 Hours: Total Flow (Per Cent)
1	20	2.45	4.20
1	40	1.87	3.44
1	80	2.01	3.42
1	120	2.49	3.97
1	160	2.86	4.18
2	20	2.45	3.85
3	20	2.00	3.54
4	20	2.28	3.82
5	20	2.34	3.50
6	20	2.02	3.60
7	20	2.48	3.84

In my hands, a specimen condensed with a Black No. 2 amalgam condenser under a thrust of 15 pounds shows a total flow equivalent to a total condensation pressure of approximately 10,000 pounds per square inch. It is doubtful whether greater condensing thrusts than this can be employed consistently in dental practice. On this basis, a study of Figure 3 shows that only the portion of the curve for condensation pressures less than 10,000 pounds per square inch is of clinical significance. The higher condensation pressures were employed only to determine whether the flow ever approaches a zero value. Evidently, it does not.

Consideration of the flow at condensation pressures less than 10,000 pounds per square inch leads to a rather disturbing conclusion. As may be noted from the solid line curve in the figure, comparatively slight differences in condensation pressures will cause large increases in flow. Obviously, from a clinical viewpoint, uniformly heavy thrusts of the condensing instrument are impractical, particularly in inaccessible areas. Furthermore, in order to obtain good adaptation, the size of the condensing point cannot be kept constant. In the present research, all comparisons have been made with the Black No. 2 condensing instrument. The No. 1 instrument is more effective for adaptive pur-

*For the benefit of the mathematically inclined, the formula is: $\gamma=\beta\varepsilon^{\delta/P+\alpha+\theta}$, where γ is the percentage flow in twenty-four hours, P is the condensation pressure, and β, δ, α and θ are parameters which depend on temperature, composition, etc.

poses than for condensation, because of the relatively small area of the point. The No. 3 instrument would be more effective in condensation than the No. 2 condenser, if the packing thrust were made greater in proportion to the areas of the two condenser points. In any event, the restoration is likely to be more subject to flow than are the research specimens, and if the flow is of the magnitude shown by the solid line curve in Figure 3, for condensation pressures less than 10,000 pounds per square inch, it would be doubtful whether any amalgam restoration could withstand the stresses of mastication for any considerable period without serious distortion.

However, in the hands of a skilled operator, the fillings do not, as a rule, exhibit serious flow properties. This apparent contradiction of the laboratory data may be explained upon the basis of constant flow. As previously noted, the less the condensation, and consequently the greater the amount of residual mercury, the greater the delay in time at which the constant flow begins. In this respect, the heavier condensation is very important. However, as may be noted from the broken line curve, the property of constant flow is not so sensitive to condensation pressure as is the total flow. The American Dental Association Research Commission requires that the flow test begin three hours after trituration because it was the opinion that if an amalgam hardened sufficiently in this time to withstand the flow test, it would not exhibit great flow under ordinary stress.[12] It is, of course, conceivable that the restoration might not be subject to great stress for a period of even nine or more hours after insertion, because of a postoperative sensitiveness in the area. In such an event, the amalgam would be in the condition analogous to the constant flow portion of the flow curves, except when very light condensation pressures are employed. However, such light pressures are not likely to be employed by a good operator. If the above-mentioned theoretical considerations are accepted, according to Figure 3, it is conceivable that a condensing thrust of as low as 3 or 4 pounds with a No. 2 condenser may be adequate as far as danger of distortion from flow is concerned, provided the suggestions of Black are followed faithfully. However, these lower packing thrusts are not advisable, not only because of the danger from excessive flow during the maturing period, but also because of the excessive expansion which is almost sure to result.

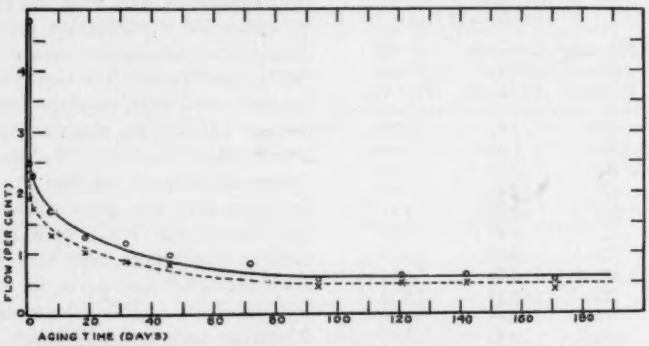

Fig. 5.—Effect of aging amalgam at 60° C. (140° F.) on flow. The solid line curve represents the effect on total flow and the broken line the effect on constant flow.

The influence of trituration time on flow was not great in the case of this

particular alloy (Fig. 4). Although an "optimum" trituration was found with the two methods, the difference between the maximum and minimum flow is not great. However, the influence of trituration time on dimensional change is rather critical, and, for this reason, it should be governed accurately.

It is interesting to note from Figure 4 that palming was more important as regards changing of the amount of flow than was the mortar trituration. Though a certain amount of palming is necessary to produce a smooth mix, it would seem that a mortar trituration is somewhat safer in that the flow is more easily controlled. No difference in flow could be detected for a given trituration time, whether the palming was accomplished with the bare hand, with surgical rubber or with cellophane.

TABLE 3.—EFFECT OF AGING AT 60° C. (140° F.) ON FLOW

Time (Days)	Flow in 24 Hours: Constant Flow (Per Cent)	Flow in 24 Hours: Total Flow (Per Cent)
0.125	2.20	4.36
1	1.96	2.48
2	1.76	2.26
8	1.31	1.70
19	1.04	1.28
32	0.86	1.16
46	0.82	0.98
72	0.69	0.82
94	0.48	0.56
121	0.52	0.64
142	0.52	0.64

SUMMARY AND CONCLUSIONS

The plastic flow of an amalgam from an alloy of silver, 68.8 per cent; tin, 26.8 per cent, and copper, 4.4 per cent, has been studied from the standpoint of both an analysis of the curve for plastic flow and the effect of certain dental manipulations on flow. The shape of the curve was shown to consist of a straight line portion and a curved portion. The amount of flow which would result in twenty-four hours when the straight portion of the curve was extrapolated to zero time was called the constant flow, and the flow measured as usual was called the total flow.

As far as the amalgam alloys studied were concerned, it may be concluded that:

1. The flow test devised by the American Dental Association Research Commission tests not only the flow, but also the hardening rate and the homogeneity of the amalgam.

2. More attention should be given by the dentist to the production of a homogeneous amalgam restoration in line with the findings of G. V. Black.

3. As far as the property flow is concerned, the pressure of condensation is not so great a factor as has been supposed, but light condensing thrusts are not indicated because of the danger of overexpansion.

4. Both the constant flow and the total flow decrease to a minimum and constant value as the amalgam is aged, and become very nearly equal in magnitude.

5. Within the limits of reasonable practice, neither the method nor the time of trituration greatly affects the flow. However, mortar trituration with light pressure on the pestle is slightly more effective in the control of flow. In any event, attention must be paid to the trituration method because of its critical influence on dimensional changes.

6. The amalgam always exhibited a certain degree of flow, regardless of the treatment.

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EIGHT YEARS OF IMMEDIATE DENTURE SERVICE

By Alfred W. Simonson, D.D.S., Minneapolis, Minn.

When patients come to the crossroads of their dental life and realize that they must give up their upper teeth, it is a comfort to them to know that the transition from the natural to the artificial can take place with very little, if any, publicity.

Immediate open-faced dentures with the anterior teeth abutting directly against the gums are not new, but because the form of the anterior part of the mouth is dependent on the shape of the dental arch, the profile of the patient begins to change almost immediately after the extraction of the teeth. This paper deals with the making of an upper denture with a full labial rim inserted at the time of extraction and alveolectomy, thereby giving the patient an immediate denture service that literally saves his face. The procedure as outlined here is that used in my office. After eight years of this type of work, I am more convinced than ever that this service is of great value to both the dentist and the patient.

Read before the Section on Full Dentures at the Seventy-Fourth Annual Midwinter Clinic of the Chicago Dental Society, February 17, 1938.

Many people, when they learn that they have to lose their teeth, have a struggle with themselves based on personal pride. The dentist who makes it possible for them to bridge the gap from natural to artificial teeth without the change being known to their family, friends and business associates is giving them an incalculable service. To illustrate: A sister of a nurse in an office next to mine had this type of work done without her mother, with whom she lives, or her office associates ever knowing it. A distinguished Wisconsin lawyer, living within 150 miles of Chicago, returned home four days after insertion of the immediate denture. Two years later, I received a letter from his wife about the condition of her husband's teeth, as he was not well. She did not know that his upper teeth were all out and that he was wearing a plate. Any number of my patients, after the work is finished, express the wish that they had had it done before. That is the feeling we wish to create. It means enthusiastic patients, and that makes the service a practice builder.

Regardless of the fact that a patient

presents himself for this type of denture service, we should make our own diagnosis. This affords time to get acquainted with the patient while we are listening to his story, taking impressions for study casts and making full-mouth roentgenograms. Six years ago, a woman with only three remaining upper teeth came into my office for an immediate denture. After hearing what she wanted and all she expected, I told her to keep the teeth that she had to help in the retention of a partial denture. Today, she is as happy as can be in wearing it and knows better what to expect of a denture, and she will later become a good full denture patient.

DIAGNOSIS

Roentgenograms aid in diagnosing the case, reveal abnormalities of the teeth, infections and unsuspected impactions, and, in old extraction areas, expose residual root tips.

After the case is diagnosed for a denture for either a new or an old patient, all the facts are stated plainly, and the patient is told that he has come to the point where a full denture is advisable. One of the greatest helps for the patient in making up his mind is an opportunity to see one of the finished cases. It encourages him to talk with some one who has such a denture. I often arrange that he may do this. Pictures of denture patients, both front and side views, before and after immediate denture service also tell the story of what can be accomplished. The patient then decides for himself, without undue pressure on our part, and makes a much better denture patient because of it. After he has decided to have the work done, he is told what we wish to do, the manner in which we shall proceed and what he may expect.

At this time, for a matter of record and also for the dentist's own satisfaction, it is well to take both front and profile pictures of the patient. A 35 mm. camera is ideal for this purpose, and 2½ by 3½ inch prints can be made from the small negatives at a cost not exceeding 6 cents. It is such pictures as these that are shown to prospective patients.

For the success of any type of upper denture, the lower part of the mouth must be in condition to afford at least posterior and lateral balance. The majority of cases require drop-bars, and we insist that they be made if necessary. The anterior part of the mouth must not be pounded by the lower teeth, for this undue stress destroys the anterior ridge of the upper jaw.

EXTRACTION OF THE TEETH

The next step is the extraction of the posterior teeth. Whatever is good surgical practice for the patient should be done, one side at a sitting as a general rule; and over-developed posterior tuberosities should be cared for at this time. Study casts will show how much and where the tuberosities should be trimmed. Within the last year, I have had two cases in which the natural bite was opened too much and so the anterior teeth did not meet at all; yet the tuberosities rested on the lower posterior part of the ridge when the mouth was closed. If this situation had not been corrected, it would have necessitated a further opening of the bite, and so increased the impression of gaping. (Fig. 1.)

If the systemic condition of the patient is such that only one or two teeth can be extracted at a time and the anterior teeth are more or less infected, the two central incisors are saved for the last extraction and alveolectomy preceding insertion of the immediate denture. Even these two teeth will save the profile of the patient by giving the exact relationship of the teeth to the lips and the lower jaw.

Time is allowed for the healing of the gums before the denture work is started. Everything else being equal, the better the condition of the mouth at the time one starts, the better the case will be

both for comfort and for permanency. After a patient has gone for a week without posterior teeth, he is willing to wait until the ridges are in good condition, a period of at least three weeks. I do not hesitate at all to wait longer than this if it seems advisable, and the patients cooperate whole-heartedly.

TAKING THE IMPRESSION

When the mouth is satisfactorily healed, the patient returns for the impression work. Any method of impression taking which the operator can easily handle may be used. All-plaster impressions removed in sections are too well known to be considered here. Compound and plaster are good in all cases, especially for those with protruding teeth. An open-face tray is used to eliminate the anterior bulk of material, which would distort the mucous membrane at its junction with the lip. The open-face tray can easily be placed symmetrically in the mouth and is more easily removed than the full-rim one owing to the lack of compound over the anterior teeth. The tray should be of sufficient length anteriorly and posteriorly to get the soft tissues back of the tuberosities. Sufficient black compound is employed to make an impression one-fourth inch thick. On chilling and removal, the impression is separated from the metal tray and the excess compound cut off, the undercuts are eliminated and the buccal border is muscle trimmed. The impression is the means of enabling the operator to make a cast that will give a definite border to the plate as to both thickness and height. This is the reason for the muscle trimming.

Fig. 1.—Mounted study casts showing how tuberosities may need trimming.

Muscle trimming is done by the action of the buccal muscles on the softened impression material, the buccal border of the compound being first heated by a small alcohol blow-torch. When there is a rolling over or a bulging of the material from the play of the muscles, the excess material must be cut off and the process be repeated until there is no further bulging or rolling over of the compound from muscle manipulation. The hard palate area is relieved; the case is post-dammed with red or green compound sticks, and the junction of the hard and soft palates is marked with an indelible pencil as determined by the patient saying "ah." The tray should be one-fourth inch longer than this line of demarcation.

The compound tray being correctly trimmed, compound lugs are added to each side in order that the tray may be easily removed by taking hold of or pushing down on the lugs without harming the plaster rim in the removal of the final impression. The posterior border, the hard palate area and any other place to be relieved are marked with the indelible pencil. No. 2 plaster is sifted into water and allowed to settle; the excess water is poured off, and the mass is spatulated to a smooth consistency. The compound tray is surfaced with the plaster, inserted in the mouth and seated firmly. The plaster is allowed to harden; the labial surfaces of the teeth are cleaned, and the exposed labial border of the plaster-surfaced tray is neatly trimmed. Both the teeth and the border are lubricated with oil. The assistant

now brings in a new plaster mix and adds plaster anteriorly, gently pressing it underneath the lip. The lip is not pulled away for anterior muscle trimming, to avoid distortion of the mucous membrane. Immediate dentures seem to tolerate a higher rim than do edentulous cases, an important factor in making the restoration permanent and keeping the patient's features intact.

After the labial portion hardens, it is easily removed; and the posterior part, by means of the lugs, is readily taken out without disturbing the plaster along the border. The labial part is assembled in place. The indelible markings, previously made and registered in the plaster, are lightly scratched that they may be recorded in the cast. The impression is now boxed in for flowing the cast.

A full-rim compound tray with dentocoll is especially good for patients who gag easily, provided they do not have protruding teeth. Here, a full-rim metal tray is used for the compound impression. The impression is separated from the tray, the undercuts are eliminated and the buccal border is muscle trimmed up to the cuspid region. Lugs are added to the tray buccally and anteriorly. The inside of the tray is cut away about 2 mm. to allow for a veneer of dentocoll. The impression is not cut on the incisal edge of the teeth or on the postdam. The palatal surface and the periphery of the compound tray are moistened with chloroform in order that the dentocoll may adhere more firmly. While the dentocoll is being added to the tray, the patient chills the mouth with cold water. The dentocoll surfaced tray is inserted in the mouth, with the postdam and the incisal edge of the anterior teeth as guides in seating it. After chilling, the impression is removed by means of the lugs, and flowed up immediately if possible. If not, it is kept moist.

The regular dentocoll tray of the proper size is used for a full dentocoll impression. As the tray is very shallow, the compound is built higher along the labial part of the rim and any other place where it may be shy, postdamming the posterior border. The tray is filled with dentocoll and inserted in the mouth. It is removed when thoroughly cool. If the impression cannot be flowed immediately, it may be kept in cold water.

Duplicates are made of the original casts, whatever the type of impression. These are best made with "flexo," which requires a day for chilling and congealing, although they may also be made with dentocoll.

Fig. 2.—Bite-plates with generated path of black carding wax covered with tinfoil.

In making drop-bars, which are a common feature of upper dentures, a plaster impression for the attachment case is usually taken so that metal teeth can be poured. However, low-fusing metals now allow also the use of plastic materials. If articulation is against a full natural lower denture, a shallow plaster impression is the easiest and should be poured with metal.

After the impressions are taken, the

size, color and general effect of the teeth are noted so that we may have an assortment of teeth for selection when the patient returns.

At the second sitting, the bite is taken. One of the "highlights" of immediate denture service is the use of the natural teeth as a guide for a correct bite. The vertical dimension must be considered at this time. Most cases require an opening of the bite. At this time, too, the individual teeth are matched from the assortment at hand. Gross irregularities are

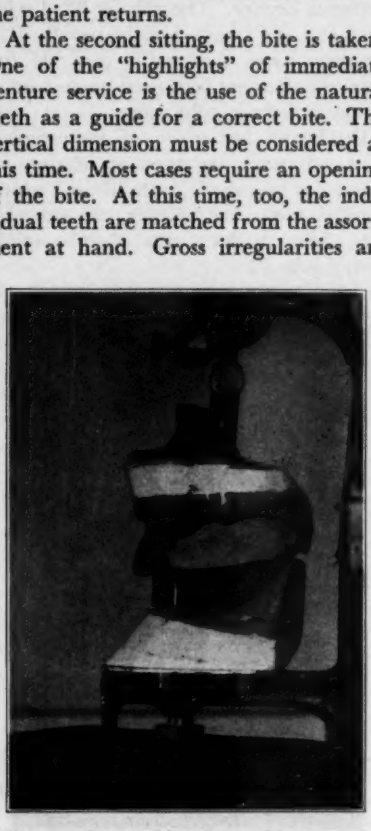

Fig. 3.—Upper bite-plate with generated path in stone.

not to be copied too faithfully: a suggestion is often all that is necessary. Fillings and stains used with discretion can be of aid in making the patient look natural. Mr. Carl Rawson, the portrait painter, says that he always tries to produce a pleasant likeness of the sitter; and so should we with our dentures.

The two upper casts are mounted to the common lower, and the denture is made on the master model.

In making an immediate denture together with a lower drop-bar or a full or immediate lower denture, I like Frederick S. Meyer's technic for determining the natural occlusal path and setting up teeth to that plane. This is one of the most fascinating and thought-compelling improvements in prosthetic technic, as far as articulation is concerned. His method is as follows: The casts are mounted on a Meyer straight line articulator or any articulator that can be used as such. Two new sets of bite-plates, one of base-plate and compound, the other of base-plate and wax, are made and built up to within 2 mm. of the arbitrary occlusal plane of the predetermined bite. Three millimeters of carding wax is added to the occlusal plane of the bite-plates, after which the bite-plates are smoothed and covered with No. 60 tinfoil. The bite-plates are put in the mouth, and the patient is told to chew gently, when the soft wax, giving way posteriorly, anteriorly and buccolingually, will form a natural curve of Spee for that particular patient, with his own anterior teeth as a guide. The chewing movement is continued until the bite, previously decided on, is reached. (Fig. 2.)

On the second set of bite-plates, those of base-plate and compound, the occlusal path is made in stone. For this, the upper bite-plate with the generated path is first placed on the articulator with the unused lower bite-plate, which has been cut down to allow a sufficient covering of a mix of rapid setting stone; the tinfoil is lubricated, and the upper cast gently closed on the lower into the soft mix of stone and left to harden, thus making an exact reproduction of that path. The process is reversed to obtain the upper path in stone. Then the two stone paths on the articulator are smoothed so that the two occlusal planes come together nicely. For setting the posterior teeth, the upper stone path is replaced with the waxed bite and the teeth are set in one at a time against the stone path of the lower, which has been freshly

painted with Prussian blue. The blue markings will tell of offending cusps, which must be ground until the occlusal surface rests squarely on the stone with the tooth in proper alinement. After the upper posterior teeth are set to the generated plane of the lower, the articulator is opened so that the finished lower teeth will be about 0.5 mm. higher than the normal bite. This is done to allow for the settling of the drop bar after wearing. The process is reversed for the lower teeth, which are first placed to interdigitate with the upper. (Fig. 5.)

Fig. 4.—Upper posterior teeth set to generated path of stone on lower.

Fig. 5.—Lower teeth.

Facial restoration depends on a duplication of the anatomic structures of the oral cavity which make up the framework of the mouth. The immediate denture must simulate these structures. The profile of the upper lip is dependent on the form given the maxillae by the anterior teeth, the alveolar process and the mucous membrane. If this form is destroyed, it must be replaced. Roentgenograms or bent-wire profiles and silhouettes are interesting and of some value, but an exact technic must be followed to insure a replica.

If the anterior teeth are off center the incisors should be set up first. An incisal guide is made by letting the anterior teeth of the upper model sink into softened compound fastened to the anterior teeth of the lower cast, and thus recording the incisal position of the upper teeth. The compound is trimmed flush with the teeth. The central and lateral incisors and cuspids are carefully cut off at the gingival border with a fissure bur. The cutting away of the plaster must allow for the bulk of plate material and for the exact placing of the teeth as shown by the incisal guide or as deviating from it for correction. The resection of the cast, as in the mouth, usually extends about two-thirds of the way upon the alveolar process and is tapered to meet the edentulous ridge. (Figs. 6 and 7.)

After the teeth are in place, they are waxed to conform and harmonize with the contour of the untouched half of the

model, which has been saved to serve as a control. Then the remaining teeth are cut off and this portion of the model is resected as just described. The teeth are placed and waxed to harmonize with the teeth set up on the opposite side. Any deviation from the anterior natural teeth for correction is under definite control because of the labial and incisal guides. The anterior part of the mouth is now complete and, from a dimensional standpoint, that portion of the replacement is kept intact with the exception of the peripheral seal in the upper third portion, the space in that area allowing for the bulk of plate material without influencing the lip.

If the upper denture is made with an immediate lower, the case is treated as with the drop-bar except that the anterior teeth of the lower cast are cut off last. These teeth are replaced with the same technic as the upper. There is much less trimming of the lower cast than of the upper.

In making an upper immediate denture with a natural lower, the upper teeth are articulated against the metal lower on a balancer or on your favorite articulator, the bite being opened 0.5 mm. This is done to allow for spot grinding of the posterior teeth in the cusp analysis of the finished denture in the mouth to give it balance, and leaves the anterior teeth without impact shock after the denture has been corrected for centric and lateral articulation.

Fig. 6.—One half anterior part of cast trimmed. The opposite side is the labial control; the incisal guide is the incisal control.

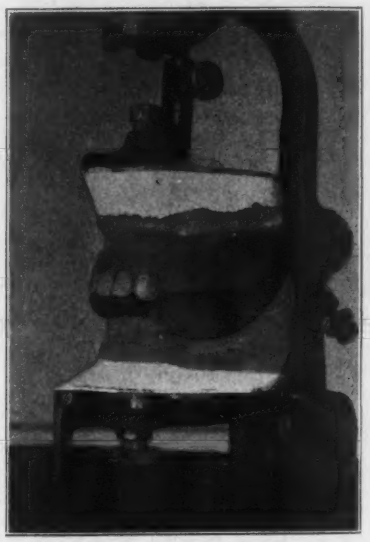

Fig. 7.—One half uncut side serving as labial control; incisal guide as incisal control.

If the vertical dimension has been increased, the six anterior teeth will not touch the lower in centric relationship. This may puzzle you, I know, because the question has been asked me so many times: "Do you set the teeth in?" By no means! If the patient is to be kept looking the same, keep his teeth as they were; and the support of the upper lip must not be changed. It is for this

reason that I like a certain type of old teeth better than the new ones, because, in most of them, the incisal portion is thicker.

With the teeth set up, the posterior part may be removed and tried in the patient's mouth as a partial denture to check up on color and to give the effect of the whole. If a drop-bar is being made, it can be finished and tried in the mouth with the upper posterior teeth while they are still in wax.

At this time, if it has not been previously done, the upper cast is postdammed so as to insure a good posterior peripheral seal. Everything then being in order, the plate is ready for flasking.

Several materials may be used for the finished plate; but, after all is said and done, vulcanite is still the best for reliability. The fact that a denture material will show as did the natural gum has led to the use of various translucent products, such as hecolite, resovin, vidon and luxene. Resovin and vidon, like hecolite, are molded materials pressed into shape. Where such pressure is employed, there is always danger of movement of the

Fig. 8.—Cast trimmed.

Fig. 9.—Teeth set up on opposite side serving as labial control, incisal guide as incisal control.

with the technic of Dr. House. With a burnisher, the shape and depth of the soft tissues of the hard palate just anterior to its union with the soft palate are determined. One-half the depth of a No. 10 round fissure bur may be cut into the cast along the line of the posterior border. Then, with scrapers the postdamming is finished by cutting the cast to conform to the depth and shape of the soft tissue area at this part of the mouth

teeth during the flasking process; and, with hecolite, there is danger of warping when the plate is out of the mouth unless it is left moist. The resovin-formaldehyde products, known as bakelite, of which luxene is one, seem the best of the opaque materials. Their fusibility lessens the danger of movement to the teeth; they can be added to and repaired; they hold their color well, and they have con-

siderable strength. The majority of the upper dentures are made of luxene.

The "big day" for the immediate denture patients arrives with the extraction of the anterior teeth and the insertion of the finished denture. The denture must fit; the bite must be correct, and it will be.

The surgical procedure differs with the individual surgeon. The result that is wanted is enough of an alveolectomy to insure the proper placement of the denture, no more and no less. Before the operation begins, luminal (phenobarbital) or some other sedative may be given if the patient is unduly nervous. Procaine is the anesthetic used in nearly all cases; gas, however, has been used in a few cases with nice results.

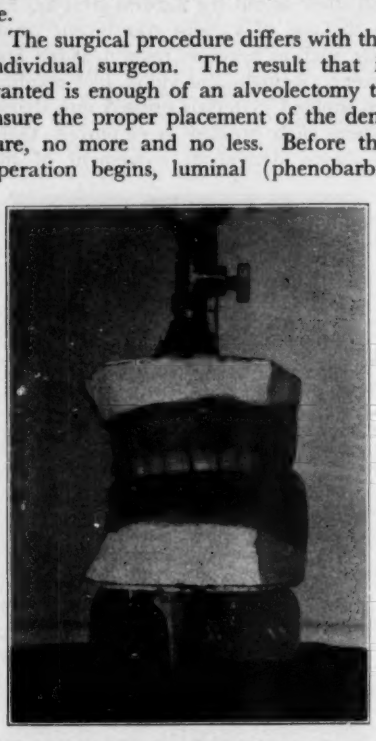

Fig. 10.—Anterior six teeth to place in exact alinement of natural teeth.

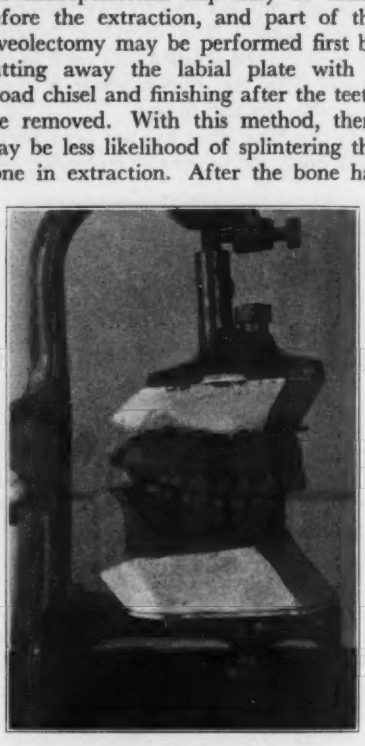

Fig. 11.—Complete set-up.

SURGICAL PREPARATION

After the extraction, incisions, from 1 to 2 cm. in length, are made posteriorly from the last tooth socket on the crest of the ridge, or curved upward. The mucoperiosteal flap is raised with a sharp periosteotome, care being taken to leave the periosteum attached to that part of the labial bone which is to be resected. The labial alveolar process and bony septa are reduced with rongeurs and chisels; or the mucoperiosteal flap may be raised before the extraction, and part of the alveolectomy may be performed first by cutting away the labial plate with a broad chisel and finishing after the teeth are removed. With this method, there may be less likelihood of splintering the bone in extraction. After the bone has been smoothed by filing and the débris washed away, and the pathologic tissues have been cared for, the mucous membrane is put in place and the plate inserted to see that it is seated firmly with no impingement at any place. It is surprising to see how accurately the plate fits the first time; but if there is any interference, revealed by a rocking of the plate, a little more of the bone is removed at the point of rocking and the plate is retried. A check is then made for débris and for

bleeding blood vessels in the sockets. Any excess soft tissue is trimmed so as to approximate nicely the edges of the incision, which are then sutured, care being taken not to draw the tissues. An immediate lower denture can be provided for at the time of making the upper, if operation of that extent is allowed for the patient at one sitting; if not, it is taken care of later. The operator is surprised, after a few cases, to note the standardization of the alveolectomy, the amount of trimming being relatively the same for all. The labial rim may seem too high; but this can be trimmed later if necessary, and, as has been said before, immediate dentures tolerate a higher labial rim.

Some adhesive powder is added to the denture, and the denture is seated firmly in the mouth. The patient is told emphatically not to remove the denture, but to come back the next day. As a postoperative treatment, cold packs are used to aid in reducing swelling and ecchymosis, which vary in amount with the individual. Such swelling and discoloration are nothing to be alarmed over and are the only reason for seclusion of the patient. One-half grain of phenobarbital, one-half grain of codeine and six grains of aspirin may be given the patient if he is uncomfortable. When he returns the following day, the denture is removed and cleaned thoroughly. The mouth is washed out and inspected for any peripheral soreness, and if there is any irritation, the plate is trimmed accordingly.

After forty-eight hours, or later, the stitches are removed. At this time, with a properly muscle-trimmed denture, there should not be much soreness unless it is along the labial border or in the posterior region where the postdamming may have been overdone, a good rather than a bad feature. Bulging tuberosities can also be troublesome unless one or both have been previously trimmed.

After a few days, when the denture is well settled in place, the articulation is corrected by cusp analysis and careful spot-grinding. This has been allowed for in the making of the denture.

If there is any question on the part of the patient as to the position of his teeth, mounting the duplicate upper model with the lower on the articulator will convince him beyond all doubt. I have had only one patient question the setup of her teeth, and she was entirely satisfied with such a demonstration.

No time limit can be set for the proper functioning of an immediate denture. During the eight years that I have made them, less than a third have been refitted; but when refitting is necessary, I mention an extra denture. Business people and others who do not want to be seen without their teeth even for a day are only too glad to have an extra denture, which may be made of vulcanite, for an emergency. When the extra denture is finished, the first plate is cared for. After the refitting of a luxene denture, the entire plate is flasked with the added impression material, after which the old luxene is removed and new substituted.

The reason for the permanency of these dentures is the time allowed for the posterior healing, the lack of interference with their peripheral seal, the lack of pounding anteriorly and the balance of articulation in centric and lateral occlusion.

I know of no work in dentistry that has given either me or my patients as much pleasure during the last eight years as have immediate dentures.

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CARSON, K. P.: Immediate Denture Service. *D. Survey*, 11:17, September 1935.

1649 Medical Arts Building.

THE JOURNAL *of the*
AMERICAN DENTAL ASSOCIATION
and THE DENTAL COSMOS*

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Published by the American Dental Association
212 East Superior St., Chicago, Ill.

All expressions of opinions and all statements of supposed facts are published on the authority of the writer over whose signature they appear, and are not to be regarded as expressing the views of the American Dental Association, unless such statements or opinions have been adopted by the Association.

Communications intended for publication in the scientific or literary pages of THE JOURNAL should be addressed to the Associate Editor. All advertising or business matter should be sent to the Business Manager.

Subscription is included in the annual membership dues. The subscription rate to non-members is $5.00 a year in advance, this rate applying to both domestic and foreign subscriptions. All foreign subscriptions are to be paid in United States money.

*In deference to the wish of the dental profession to control its literature, *The Dental Cosmos*, founded in 1859, was transferred by the publishers as a gift to the American Dental Association, January 1937.

**Deceased.

DENTISTRY AND THE RED CROSS

THE unfortunate refugees from great disasters in this country in the future will receive not only food, clothing, medical service and shelter, but also adequate dental service.

It is with prideful satisfaction that we announce to the dental profession and the nation at large that the offer of the services for helpful assistance that can be rendered by the dental profession to the National Red Cross in times of distress has been most graciously accepted by that organization, and thereby is recorded another recognition of the value of the health service which dentistry may render to humanity.

This act on the part of the Red Cross marks an epoch in the history of dentistry which signalizes a broadening acceptance of dentistry as a worthy ancillary to medicine and is of much significance to the profes-

sion as a recognition of the help which dentistry may render in times of distress.

From the very organization of dentistry as a profession constituting a part of the healing art, it has sought, nay demanded, recognition of its field of activity as a legitimate department of medical science and art. The knowledge gained of the relationship between the mouth structures and the body, made manifest by researches in both dentistry and medicine, has impelled such recognition from various sources—lay, professional and governmental—the most recent instance being the establishment of the Dental Corps in the Navy on the same basis as the Medical Corps.

The service of dentistry has come to be regarded as one of the indispensable aids in the conservation of health, not only in Government circles, but also in all walks of life. The latest institution, and one which may be considered semi-governmental because of the wide support it receives from governmental sources, to recognize dentistry as an important health service is the Red Cross, an organization which through its beneficence in times of stress and calamity has won its way into the hearts of the people the world over. The Red Cross has, through its many experiences in the past, realized the indispensability of oral health in its relation to the health of other parts of the body and was eager to accept the offer of dental services on an extensive and organized basis, and we are confident that the services which can be rendered will enable this wonderfully capable organization to render even more valuable services to the unfortunate victims of distressful calamities.

At the suggestion of Dr. C. Willard Camalier, President of the American Dental Association, a committee on disaster relief was appointed, and with the cooperation of Mr. James L. Feiser, vice-chairman of the Red Cross, the committee has perfected a plan by which practically all state and component societies of the American Dental Association from coast to coast are now selecting, in every city and town where there is a Red Cross chapter, dentists best fitted to serve the Red Cross.

On recommendation to the local and state societies, these dentists will be appointed to the Preparedness Committee of each local Red Cross chapter, and their work will be under the directive guidance of a national committee, composed of Drs. Harvey J. Burkhart, Rochester, N. Y., chairman; E. G. Meisel, Pittsburgh, Pa., and Philip E. Adams, Boston, Mass.

The dentists' work in time of disaster will be four-fold under the new American Dental Association plan:

First, emergency dental care will be given in refugee centers. Dental offices will be set up as quickly as possible for extraction of abscessed or badly decayed teeth and relief of pain.

Second, artificial dental structures which have been lost or damaged will be replaced or repaired.

Third, fracture of the jaws and other injuries of the mouth will receive immediate surgical treatment.

Fourth, surveys will be made of dental conditions of refugees, and necessary work will be done to prevent epidemics of mouth diseases.

Through the active participation of dentists on the Red Cross preparedness committees, such dental supplies and equipment as are needed in time of emergency will be readily available and all arrangements will be made for quick action when disaster comes.

Dentistry has been criticized in the past for its lack of willingness to render public service without compensation. The practical evidence of the spirit of the humanitarian altruism of dentistry in the present instance is indisputable refutation of that type of criticism, for this service is not offered in the hope of reward in any material sense, but to demonstrate the importance and value of our ministrations in conserving the health of those so unfortunate as to be the victims of disaster.

For many years, in fact for more than a half century, the dental profession has endeavored, and with considerable success, to impress upon those concerned in the administration of state and national affairs the importance of dental service to a complete health service. In the acceptance by the Red Cross of the plan of the Disaster Relief Committee, we have another opportunity to further extend our service to humanity, and we believe that dentistry will gladly embrace this opportunity.

It is an accepted axiom of humanitarian philosophy that every opportunity carries with it a corresponding responsibility, and the application of that principle to the present case is manifest. If we are to justify the recognition which has been accorded us, our achievements in scientific professional progress must keep pace with what they have been in the past.

L. P. A.

OBITUARIES

ARTHUR CLYDE LA TOUCHE

(1876-1938)

ARTHUR CLYDE LA TOUCHE was born November 13, 1876, at Ashland, Ill., son of Thomas B. and Capitola La Touche. He was graduated from Northwestern University Dental School in 1899.

In 1910 he became associated with the College of Dentistry, University of Southern California, where for twenty-eight years he was an invaluable aid in the growth of the college. For many years, he was secretary of the faculty, a member of the board of trustees and professor of operative dentistry and histology.

The many honors conferred on him were accepted with characteristic modesty. His greatest reward always was found in the knowledge of a task well done.

Dr. La Touche was a Mason; a member of the Trowel Fraternity and of the honor societies Phi Kappa Phi, Alpha Tau Epsilon, Omicron Kappa Upsilon, and Skull and Dagger; a Fellow of the American College of Dentists; a member of Delta Sigma Delta Fraternity; an honorary member of the Alumni Association, College of Dentistry, U. S. C., and a life member of the Los Angeles County Dental Society and the Southern California State Dental Association.

The privilege of close personal friendship was not necessary to reveal his unfailing and charming courtesy, his clear, straight-line thinking, the thoroughness of knowledge in whatever interested him, and his simplicity, for his learning was designed for use, not ostentatious display. The warmth and kindliness of his nature were felt by all who shared his interests.

Death came suddenly on Tuesday, May 10, at his home.

WILLIAM EDWARD HARPER

(1865-1938)

WILLIAM EDWARD HARPER was born in Doncaster, Yorkshire, England, February 12, 1865, the son of John and Hannah (Boyd) Harper; died August 17, 1938. He was educated in the public schools and at Mechanic's Institute, Crewe, Cheshire, England. In 1881, he came to America and, after graduating from the American College of Dental Surgery, in 1891, began the practice of his chosen profession in Chicago. June 5, 1895, Dr. Harper married Miss Clara Garrison. They were the parents of three children, Clarence E., Dorothy and Louise.

In 1893, Dr. Harper was appointed professor of operative technic in the American College of Dental Surgery. Later, he was responsible for bringing about the affiliation of the American College of Dental Surgery with Northwestern University Dental School. In this new dental school, Dr. Harper served as professor of operative dentistry, as secretary of the faculty and as business manager, in which capacity he was responsible for bringing Dr. G. V. Black to the faculty.

In the early years, Dr. Harper contributed generously to the dental literature, writing on such subjects as operative dentistry, the use of aluminum in dentistry, amalgam and treatment of root canals. Of late years, he was interested in the manufacture of dental alloys, and gave many lectures and clinics throughout the country on amalgam technic.

DEATHS

Barry, L. S., Adair, Ia.; College of Dentistry, University of Iowa, 1911; died May 26; aged 50.

Batcher, W. H., Toledo, Ia.; College of Dentistry, University of Iowa, 1896; died April 29; aged 70.

Becker, M. A., Lancaster, Pa.; Ohio College of Dental Surgery, 1890; died May 5.

Beechler, Dale X., Salem, Ore.; Indiana University, School of Dentistry, 1904; died May 1; aged 55.

Bergbom, George, Chicago, Ill.; Northwestern University Dental School, 1903; died June 1; aged 59.

Bronson, Jesse Lyman, Waterloo, Ia.; Northwestern University Dental School, 1905; died July 3; aged 59.

Burnett, Clarence H., Dunkirk, Ind.; Indiana University School of Dentistry, 1912; died June 3; aged 57.

Butler, George Henry, Skaneateles, N. Y.; Pennsylvania College of Dental Surgery, 1882; died July 26; aged 77.

Cooper, Rose, Indianapolis, Ind.; Indiana University School of Dentistry, 1898; died June 28.

Cowger, T. Erle, Monticello, Ind.; Chicago College of Dental Surgery, 1904; died May 26; aged 58.

Cree, Charles G., Winnetka, Ill.; University of Illinois College of Dentistry, 1906; died June 3; aged 57.

Crist, John H., Chester, Pa.; Pennsylvania College of Dental Surgery, 1900; died April 23; aged 62.

David, Ira A., Chicago, Ill.; Chicago College of Dental Surgery, 1912; died August 23; aged 53.

Deutsch, Herman S., Chicago, Ill.; University of Illinois, College of Dentistry, 1912; died June 28; aged 51.

Evans, Griffith D., Chicago, Ill.; Chicago College of Dental Surgery, 1899; died August 23; aged 69.

Ferebee, J. M., Richland Center, Wis.; University of Louisville School of Dentistry, 1897; died July 8; aged 74.

Gallagher, Oscar H., Grinnell, Ia.; State University of Iowa College of Dentistry, 1903; died July 10; aged 60.

Grover, J. L., Taylor, Tex.; University of Tennessee, College of Dentistry, 1917; died May 20.

Harrison, Frank H., Wichita Falls, Tex.; Atlanta-Southern Dental College, 1919; killed in an automobile accident, June 18.

Hoover, W. A., Gibson City, Ill.; University of Michigan, College of Dentistry, 1886; died April 2; aged 76.

Poundstone, George C., Chicago, Ill.; Northwestern University Dental School, 1902; died May 9.

Reece, John S., Bloomington, Ill.; Northwestern University Dental School, 1901; died June 18; aged 68.

Roble, Melvin, Chicago, Ill.; Northwestern University Dental School, 1925; died June 17; aged 40.

Rose, Torret A., Sioux City, Ia.; died June 20; aged 89.

Smith, Thomas Hutchinson, Bloomington, Ill., University of Pittsburgh Dental College, 1906; died June 5; aged 59.

Stahl, Charles H., Chicago, Ill.; Northwestern University Dental School, 1887; died July 21; aged 73.

Ward, W. C., Garden Grove, Ia.; Western Dental College, 1904; died May 12.

Weeks, Thomas E., Minneapolis, Minn.; died at La Crosse, Wisconsin, March 1, 1938. Dr. Weeks entered dentistry through the apprenticeship system in 1873, and in 1883 established himself in practice in Minneapolis, where he became one of the founders and Dean of the College of Dentistry of the University of Minnesota, in 1888. He served the institution in that capacity and as Professor of Operative Dentistry until 1901, when he resigned. From 1907 to 1912 he was Professor of Operative Technics in the Philadelphia Dental College; then removing to Argentine, where he practiced for ten years, returning to the United States in 1922, and practicing in La Crosse, Wis., until he died. Associated in a teaching capacity with dentistry through practically his whole career, few men in the profession have had such a long, active and influential part in its development as has Dr. Weeks.

Welch, Charles Elmer, Bloomfield, Ind.; University of Michigan, College of Dentistry, 1890; died June 16; aged 69.

COUNCIL ON DENTAL THERAPEUTICS

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

Dentifrices*

Elder's Tooth Paste: Composition: See Sheffield Tooth Paste (A.D.R. 1938, page 117).

Manufactured by the Sheffield Co., New London, Conn. Distributed by the Elder & Johnston Company, Dayton, Ohio. No U. S. patent or trademark.

Philadelphia Mouth Hygiene Association Tooth Paste: Composition: Each 100 grams is stated to contain precipitated calcium carbonate (Snow Top, Light), 44.0 gm.; soap powder Castile, U.S.P., 1.0 gm.; powdered gum tragacanth, U.S.P., 1.0 gm.; magnesium carbonate, U.S.P., 1.0 gm.; magnesium hydroxide, U.S.P., 3.50 gm.; glycerin, C.P., 30.0 gm.; water, 18.40 gm.; saccharin, U.S.P., 0.10 gm.; flavor (peppermint, menthol, U.S.P., anise, orange) 1.0 gm.

ABRASIVENESS: 3.5 mg. on an antimony block under a weight of 63 gm. in 6,480 revolutions.

Manufactured by the Trade Laboratories, Inc., Newark, N. J. Distributed by the Philadelphia Mouth Hygiene Association, Philadelphia, Pa. No U. S. patent or trademark.

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information on the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

*A.D.R. 1938, page 112.

VINCE

VINCE (Vince Laboratories, Inc., 113 West 18th Street, New York City), a sodium perborate preparation, which is promoted and sold to the public without restriction and without declaration of composition on the label, has run afoul of Federal law.

FEDERAL TRADE COMMISSION

Washington

(Stipulation 02190) August, 1938

False and misleading advertising in connection with the sale of a medicinal preparation designated Vince will be discontinued by Vince Laboratories, Inc., 113 West 18th St., New York, under a stipulation it has entered into with the Federal Trade Commission. The stipulation also was signed by William R. Warner & Co., Inc., which owns and controls Vince Laboratories, Inc.

Representations to be discontinued are that Vince is an adequate treatment for colds, tonsillitis, rhinitis, pyorrhea, and acute pharyngitis, and that it will neutralize the acid condition of the mouth except for a limited period of time. The respondent companies also will cease representing without qualification that Vince is recommended by dentists and physicians as an ideal aid to sparkling teeth, a clean mouth and a clean throat.

The profession will note that the Federal Trade Commission has not only

taken action against the false and misleading therapeutic claims of Vince, but has also acted to restrain the practice of hanging these claims on the dental profession.

The Council has emphatically and repeatedly asserted that sodium perborate is a potentially dangerous drug and that its use should be restricted to those cases which are under the supervision of a dentist or a physician (A.D.R. 1938, p. 178). That restriction will come when the profession acts in unity to help bring it about, and particularly when all component societies cooperate with the central organization in much needed reform.

FILM FLOTE—NOT ACCEPTABLE FOR A.D.R.

Report of the Council on Dental Therapeutics of the American Dental Association, authorized for publication.

IN accordance with the established policy of the Council, the following report was sent by registered mail to the Film-Flote Company, at the address designated on the package label. The letter was returned with the notation: "Not at Address Shown—Not in Directory, Searcher No. 21." Despite the apparent lack of prominence of the firm, the report is published in response to many requests.

Sufficient inquiries have been received by the Council on Dental Therapeutics to warrant a report on Film Flote. Apparently, Film Flote is manufactured by the Film Flote Company of Miami, Fla.

According to the data on the package label, the product Film Flote is issued under U. S. patent No. 2,031,169, serial No. 748,427. U. S. Patent No. 2,031,169, serial No. 748,427 was issued to one Gilbert Dillie Laymon. A Gilbert Dillie Laymon is a dentist, but is apparently not a member of the American Dental Association.

According to the patent specifications, the preferred and practical formula for the invention is as follows:

Solution No. 1	Iodine, 3.3%
Solution No. 2	Sodium thiosulphate 5%

The patent further states:

Another object of the invention is to provide a stain remover comprising complementary substances, separately applied, the first of which is of deep penetrable nature with respect to the mucin plaque so as to sink in at least as far as the stain to be removed, and the second substance being reactive with respect to the first so that when applied to the film subsequent to the application of the first substance, a chemical action occurs in situ throughout the depth of the stain, which not only disintegrates the mucin film through the kinetics of the reaction, but at the same time decolors and obliterates the stains probably through oxidation.

Considerable space is devoted in the patent to an exposition of the chemical reactions occurring between iodine and sodium thiosulfate. These reactions are fully explained in elementary textbooks on inorganic chemistry.

It is highly improbable that the "kinetics of the reaction" between iodine and sodium thiosulfate can disintegrate the mucin film, even granting that the mucin film does exist and granting further that it should be disintegrated.

As far as the Council is aware, there is no published scientific evidence to the effect that the use of iodine and sodium thiosulfate can loosen the "film" as is claimed in the patent.

According to the circular accompanying each package of Film Flote, "A survey of mouths will show that four out of five have dull lusterless teeth." The phrase, "Four out of five" is not original and, in the connection used, it has no published factual basis.

The advertising circular further relates that:

Present day methods of cleaning our teeth are inefficient. Cleansing of teeth always has been and always will be a problem of removing film. It is only recently that a method has been found where this can be accomplished easily, harmlessly, completely and scientifically. It can be done by the application of Film Flote. . . . The mouth is left healthful, refreshed and free from bacteria.

The "harmlessness" of Film Flote is open to question. In Sollmann's "A Manual of Pharmacology," fifth edition, published by W. B. Saunders Company, the following appears concerning the action of iodine (page 863):

Local Phenomena.—Applied to the skin iodine produces a mahogany color, smarting, erythematous inflammation, infiltration of subcutaneous tissue, desquamation of the epidermis in large shreds; if repeated, vesication results. The effects on mucous membranes are more severe and may produce corrosion. Its action is chemical, since it precipitates proteins as easily dissociated compounds. It is absorbed somewhat from the skin and excreted mainly in the urine as iodide.

The Council on Dental Therapeutics requested the Bureau of Chemistry to investigate the composition of the product now marketed.

REPORT OF THE BUREAU OF CHEMISTRY ON FILM FLOTE

Two original packages obtained on the open market were submitted to examination in the Bureau of Chemistry.

Each original package consisted of a green pasteboard carton bearing a white label with the name "Film Flote, U. S. patent 2,031,169, Oct. 15, 1934" inscribed thereon. In addition, the label bore directions for use of the product and the address: Film Flote Co., Miami, Fla. Each package contained two bottles. One of them was labeled "No. 1 Disclosing Solution (Brown)" and the other "No. 2 Bleaching Solution (White)." Solution No. 1 contained 14.5 cc. of a brown solution with a strong iodine odor. Solution No. 2 contained 16 cc. of a colorless solution with a slight sediment and an aromatic odor.

Qualitative tests indicated the following: for Solution No. 1, iodine, potassium, iodide, ethyl alcohol; for Solution No. 2, thiosulfate, sodium.

Quantitative estimations yielded the following:

For Solution No. 1	
Density at 20°	0.9287
Per cent iodine uncombined	8.01
Per cent residue dried at 100°	5.69
For Solution No. 2	
Density at 20°	1.229
Per cent thiosulfate as $Na_2S_2O_3.5H_2O$	37.84
Per cent sulfated ash	21.17

From the foregoing, it is concluded that Solution No. 1 is essentially composed of iodine and potassium iodide in an alcoholic medium (the analytical values listed conform to the requirements of U.S.P. XI, page 401, for tincture of iodine); that Solution No. 2 is essentially a 37.84 per cent solution of sodium thiosulfate in water. The solution is described as a 5 per cent solution of sodium thiosulfate in the patent specification.

Since the advertising for this product is false and misleading in that there is no good evidence to substantiate the claims made; since the product contains a poisonous substance capable of doing harm to the user, and especially since no warning is given of the poisonous character of the product, the Council on Dental Therapeutics finds Film Flote not acceptable for Accepted Dental Remedies.

Subsequently to the foregoing report of the Bureau of Chemistry on Film Flote, two further trade packages of this prod-

uct were obtained. The label on the carton was identical with that previously examined and reported. The advertising circular differed from that originally examined in that bactericidal claims had been deleted and the statement in large type "Member of Miami Chamber of Commerce" has been added.

Bottle No. 1 was not examined other than to note that it contained a dark brown liquid with a strong iodine odor.

Qualitative analysis on bottle No. 2 indicated the presence of the same ions that had been found in the sample previously purchased and analyzed.

Quantitative analysis yielded the following:

Density	1.025
Per cent thiosulfate as $Na_2S_2O_3.5H_2O$	4.90
Per cent sulfated ash	2.81

It is concluded from the data presented above that Solution No. 2 is essentially a 4.9 per cent solution of sodium thiosulfate pentahydrate.

It may be concluded from a comparison of the analytical data that either very poor control has been employed in the preparation of this solution or an unannounced and an apparently unreasonable change had been made in the concentration of this solution.

A copy of the rules that govern the Council in the consideration of articles will be sent on request.

HAROLD L. HANSEN, *Secretary.*

DANGEROUS DRUGS UNDER THE NEW FEDERAL LAWS

IN the Act, "To prohibit the movement in interstate commerce of adulterated and misbranded foods, drugs, devices, and cosmetics," Section 502 (j) under the title "Misbranded Drugs and Devices," reads as follows:

"A drug or device shall be deemed to be misbranded—(j) If it is dangerous to health when used in the dosage or with the frequency or duration prescribed, recommended, or suggested in the labeling thereof."

The dental profession will be interested in the following recent releases from the United States Department of Agriculture, Food and Drug Administration, Washington, D. C.

In the opinion of the Food and Drug Administration, aminopyrine and drugs containing it (see report in the Council's series on Pharmacology and Therapeutics entitled "Agranulocytosis, A Critical Review of Causes and Treatment, Historical and General," J.A.D.A., 22:487 [March] 1935) when found in interstate commerce under labeling which may result in their use by the general public, are actionable under section 502 (j) of the Federal Food, Drug and Cosmetic Act.

The same opinion was rendered with respect to Sulfanilamide (see report in the Council's series on Pharmacology and Therapeutics entitled "Sulfanilamide: A Review of the Clinical and Experimental Work on Its Therapeutic Properties," J.A.D.A., 25:1474 [Sept.] 1938).

The health professions, dentistry, medicine and pharmacy, will be gratified to learn of this important step in protecting the general public against the evil of self-medication. It should be noted, however, that no restriction is placed upon the legitimate use of these drugs by the dental and medical professions. It is presumed that the practitioner will be guided in the use of these drugs by the pertinent available facts on their pharmacological properties.

ASSOCIATION ACTIVITIES

LEGISLATIVE COMMITTEE

THE LEGAL ASPECT OF DENTAL ROENTGENOGRAMS*

By A. Porter S. Sweet, D.D.S., Rochester, N. Y.*

IT is surprising that, for a subject of such vital importance to dentists, so little has been published in the literature of the profession about the legal aspect of radiodontia. To make a comprehensive study of the subject, it is necessary to draw largely on the literature of the allied professions of medicine and radiology. Since dentistry is, strictly speaking, a specialty of medicine, it is logical to assume that court findings in medical and radiologic cases would be repeated should similar situations be encountered in dental cases.

A careful review of the literature (dental, medical and radiologic) shows that the legal aspect of roentgenograms is not static, but progressive. Not only has the attitude of jurists changed toward their admission as evidence, but it has also changed in regard to the responsibilities of the physician and the dentist both in use of and in failure to employ roentgenograms.

HISTORY

The first recorded use of a roentgenogram as evidence in court came within four months after the date of the discovery of the x-rays.[1] In 1896, the Court of the Queen's Bench at Montreal, Canada, accepted as evidence a roentgenogram made by Professor Cox of McGill University,[2] showing the position of a bullet in a man's leg. A similar case was recorded in Chicago in 1897.[3] The following year, New York State saw the initial use of this new type of evidence in a case before the Supreme Court at Catskill,[4] wherein a woman sued a steamboat company for personal injuries. In France,[5] in 1899, x-ray records were used in court to such good advantage that a newspaper, *Libre Parole*, was convicted of libel and fined. Since the x-ray evidence was irrefutable, no attempt was made to appeal from the decision.

This brief review of the historical side of jurisprudence as related to radiography shows that not only were roentgenograms used while radiologic science was still in its infancy, but also, in one case at least, they were considered irrefutable evidence.

ATTITUDE OF COURTS

Although the courts did accept roentgenograms in evidence very soon after the discovery of the x-rays, their attitude at first was not one of whole-hearted welcome. As is always the case, it was necessary for jurists to be conservative and not make sudden, radical changes, as such a procedure would lead to conflicting opinions, some of which would be unfair. For that reason, although this new graphic evidence was gaining acceptance, it was not at first considered

*From the Medical Division, Eastman Kodak Company.

so reliable as it is today. According to Donaldson[6]: "Of x-ray evidence it may be said that since its introduction the general attitude toward it has changed from 'timorous acceptance' to 'implicit trust.'" This change took place very definitely within twenty years after the discovery of the x-rays. For those interested, the Supreme Court of Wisconsin[7] gives a good example of the "implicit trust" that now exists.

ROENTGENOGRAMS AS EVIDENCE

Although it is known that roentgenograms are accepted as evidence in medicolegal actions, there are many who cannot understand the change that has taken place in the attitude of the courts toward them. This evolution is best explained by the statement that the best evidence is that which is factual, and nothing could be more in keeping with this requirement than roentgenograms and photographs. Both present data to the jury through the medium of sight, and, as is commonly said, "one picture is worth a thousand words." Most evidence is such that the jury can learn of it only from the lips of the witnesses as it is brought out by one or the other of the attorneys. With many of them, it is a case of "in one ear and out the other."

Weston[8] clearly brings out a grave danger in malpractice suits:

> . . . the jury cannot be depended upon to understand or appreciate either the difficulties surrounding the practice of dentistry or even the facts in the case when testified to by the professional witnesses. Apparently all they can understand is that the plaintiff has suffered some injury, and, if the injury is proved, you are pretty certain to get a jury verdict.

These risks are overcome to a great extent by the use of roentgenograms. Whenever an object is viewed, the mind seems to record and retain for future use a mental image, which is more vivid and easier to recall than a picture that a lawyer tries verbally to implant in the minds of jurors. It is mainly for this reason that roentgenograms have been the deciding factor in numerous lawsuits, in both malpractice and personal injury cases.

In spite of this obvious advantage shared by roentgenograms and photographs, the fact remains that the mere introduction of the former in court is no assurance of its usefulness. It must be a good roentgenogram[9]:

> The radiologist, of course, shares with all physicians the liability for doing his work in a careless, inefficient or unskilled manner. If he ventures a wrong diagnosis on a poorly executed roentgenogram and thereby contributes to the patient's suffering or loss of time, he may be as guilty of negligence as the doctor who lances an aneurysm.

In order that there may be no chance for roentgenograms to be other than diagnostically satisfactory, the dentist should make each a perfect one. To do this, he must adopt a standardized technic so that when an error does occur, it can be quickly traced. If, for instance, the processing technic is constant with two minutes' development at 65 F.,* any change in the photographic quality of the image becomes a matter of exposure. It the roentgenogram is too light, it has been underexposed; if it is too dark, the opposite is the case. Although it is only human to err occasionally, such a technic, rigidly adhered to, will be found to be more satisfactory and conducive to better results than haphazard methods.

Not only is the quality important, but also the number of roentgenograms employed in an examination: there always should be a sufficient number to satisfy the jury in regard to thoroughness[10]:

> Many a case has been settled or lost because the defending attorneys felt the inadequacy of the records would result in a substantial verdict for the plaintiff. Roent-

*Eastman R-P periapical dental films.

genograms and written records of *all* the treatment rendered are essential.

IDENTIFICATION OF THE ROENTGENOGRAM

In the matter of identification of roentgenograms, radiologists and hospitals have a distinct advantage over dentists. Their films are always of sufficient size to permit the use of either of two methods of marking. In this way, there can be no doubt whatever as to the identity of a roentgenogram submitted as evidence. Lead letters and numerals can be placed on the cassette during exposure, or the essential data can be photographically printed on the film by means of an x-ray film identification printer. The dentist is not so fortunate with the smaller films that he uses. There is no room for marks of identification to be placed on their small areas. For that reason, when films for a number of patients are being processed at the same time, it is always best to check for identification. Matching fillings, bridgework and missing teeth will make identification positive and also assist in mounting and filing the roentgenograms. When the dentist is called on in court to identify films, it will be much easier if the dentist's attorney can bring out the fact that such precautions are a matter of routine.

In using films of larger size, the usual 8 by 10 inch or 5 by 7, it should be kept in mind that they should always have identifying marks on them. This can be done with lead letters or, better still, by use of the x-ray film identification printer. One author brings out this point very clearly[1]: "Any radiograph may find its way into the courtroom and if properly identified may be introduced as evidence."

THE DENTIST AS A WITNESS

The dentist who becomes a witness in a court proceeding must expect to be asked questions somewhat similar to the following:

1. What are your professional training and your experience in radiodontia?
2. Did you ever make an x-ray examination of John Doe?
3. Do you personally remember the event?
4. Can you identify the patient?
5. At what time and place did you make the roentgenogram or roentgenograms?
6. By what means do you *identify roentgenograms?*
7. Have you had the roentgenogram in your possession continuously?
8. What were the exposure data employed in making the roentgenogram?

OWNERSHIP OF ROENTGENOGRAMS

The question of ownership of the roentgenogram is one that has been settled definitely by the courts. It has repeatedly been ruled that they are the property of the dentist or radiologist making them and, as far as is known, there has never been a reversal of such opinion. There is one exception to this general rule: When the patient is referred to the dentist for x-ray examination, the dentist making the films acts merely as an agent of the dentist referring the patient, and roentgenograms are given to the patient, without interpretation, to become his property to take to his dentist.

Weston,[8] in 1922, made this statement in reference to the dentist's retaining possession of his roentgenograms: "The records of the x-ray should rest in the hands of the dentist or his consultant, rather than be brought into the case from the outside."

This reason is self-evident, for if roentgenograms are brought in from the outside, their value as evidence is less, since the jury naturally will not give the dentist the same credit for skill and knowledge that it would if he had taken and interpreted the films himself. A quotation from a court ruling on roent-

genograms as evidence definitely shows this attitude[11]:

> In the making and reproduction of an x-ray film for a patient, the dental surgeon or physician sells and the patient pays for, not the material that goes into the x-ray film but for knowledge and experience. . . . The court is of the opinion that the retention of said films by the person taking them is necessary as a part of his record concerning the case; retained on the same basis and on the same theory that a surgeon retains his temperature chart that he has made, or other records concerning the diagnosis or treatment of the case.

Although it is true that the roentgenogram itself belongs to the dentist making it, the fact remains that many malpractice suits arise through the demand of the patient that he be given possession of it. This usually happens when the dentist sends a statement of the amount due on account; the patient refuses to pay unless the films are delivered to him, and the dentist will not comply, knowing that he needs them for his own protection, and at this time may sue for the account. Then, if things have gone this far, the patient is apt to counter with a malpractice suit, well knowing its nuisance value. Many times, at this point, the dentist takes his loss to keep from going to court, fearful of unfavorable publicity, even though the action could be easily defeated.

For these reasons, most careful practitioners make it a practice to regularly use two-film packets and in this way protect themselves. Then, if the patient demands "his" roentgenograms, they are given to him, the dentist keeping the duplicate set on file. This procedure automatically takes from the patient any chance for argument, does away with the possibility of a nuisance suit and still gives the dentist the general advantages afforded by possession of good x-ray films.

French radiologists[12] protect themselves in a different manner, especially in industrial accident cases. They deliver one paper print of the roentgenogram to the injured person and another to the employer or his representative, keeping the original themselves. Though this method is just as efficient as the one previously suggested, it requires extra work to make the prints and does not afford any better protection.

NEGLIGENCE

A large percentage of malpractice suits are based on negligence; in fact, malpractice is a branch of the general law of negligence. This makes the failure to use roentgenograms even more dangerous, as their acceptance becomes more and more common in dentistry. As mentioned previously, cases can be cited wherein failure to make roentgenograms brought convictions of malpractice in general medicine and dentistry.

One of the many fracture cases in which a physician lost because of failure to make roentgenograms occurred in Minnesota[13]:

> Negligence in respect thereto was charged against the defendant, particularly in that he took no roentgenograms to aid in the diagnosis of the fracture or in ascertaining its condition during the curative process.

A California case[14] deals with this aspect of dentistry as follows:

> . . . the dental profession considers it dangerous to inject an anesthetic into the gum with a needle and to extract a tooth, without first making a roentgenogram to determine the cause and extent of the infection.

The court may hold that a dentist is negligent not only in not making roentgenograms, but also in not having x-ray apparatus readily available. This point was stressed in a trial involving the Illinois Central Railroad.[15] To quote Donaldson once more[16]:

> Absolute certainty that the injury resulted from negligence is not required, proof which satisfies the jury's mind to reasonable certainty being sufficient. And it may be said

here that any admission on the part of the physician which may be interpreted by the patient or jury as implying that the injury was the result of some error in technic may be sufficient proof.

LIABILITY

Donaldson[17] says that the legal aspects of roentgenograms are ". . . more or less confined to three main divisions, namely (1) liability arising out of the use of x-rays, either for diagnostic or therapeutic purposes, (2) liability arising out of failure to use the x-rays, and (3) x-ray plates or films as evidence."

While the subject of roentgenograms as evidence has been covered, nothing has been said about the other two conditions. Under ordinary circumstances, the dentist incurs practically no risk nor liability for therapeutic purposes. But this is not always the case, for there is at least one instance recorded wherein a dentist was sued for malpractice while using his x-ray apparatus with a hand fluoroscope at the request and under the supervision of a physician. Both the patient and the physician received x-ray burns, and both sued the dentist. This should be a lesson to dentists to refrain from attempting to use dental apparatus for non-dental work. Dental x-ray units are not adequately designed for medical work, and to employ them thus may be dangerous. An additional fee is always tempting, but may be more than offset by the ill-will of the medical radiologist. If x-ray films are needed therapeutically, it is far better to refer the patient to a competent radiologist.

Likelihood of injury to the patient when the dental x-ray apparatus is used for dental diagnostic purposes is practically nil. Modern films require only very short exposure; consequently, the danger of radiodermatitis is very remote. The greatest hazard the dentist now faces is in not adequately employing roentgenograms in his practice. The courts are stating with more and more emphasis that radiography must be used as a routine measure in order to practice dentistry with ordinary care and skill.

DENTISTRY—A PROGRESSIVE PROFESSION

The very fact that dentistry has always been such a progressive profession is in keeping with the demands of the judiciary that members of the profession must advance with the times. This demand is particularly emphatic in regard to the routine use of roentgenograms.

At the time of the celebrated Bauman case,[18] in 1916, dental x-ray apparatus was found in only a few dental offices. For that reason, the possession and use of x-ray apparatus was not necessary to prove "reasonable and ordinary skill." However, now that progress has made the use of such apparatus universal, the courts make the definite demand on the dentist that he use this means of diagnosis.

This demand was forecast by Kassabian[19] as early as 1907:

> The use of x-rays is so universally commended in the modern works of surgery and medicine that the surgeon who fails to apply them in doubtful cases may justly be accused of negligent practice . . . the judge and jury will frown upon a practitioner for negligence who has failed to avail himself of this most precise and scientific method in any case of doubtful prognosis, where, through its agency, practical results might have been procured.

Today, the courts are rendering verdicts against dentists for failure to own and use x-ray apparatus[20]:

> The courts have already ruled a failure to first obtain a roentgenogram as malpractice in cases in which the tooth showed clinical evidence of infection before extraction, and awarded judgment against the dentist.

Kent[21] mentions another case:

> Judgment for the plaintiff in a midwest malpractice suit some years ago was based

on the single point of evidence that the dentist had not used the x-ray in diagnosis.

Up to the present time, the cases against members of the dental profession have been comparatively few, but the day is undoubtedly coming, according to one authority[20] at least, when the courts will demand the making of roentgenograms before all extractions and surgical operations.

Weston[8] too is very emphatic about "the need of special care being taken to know the exact condition that is present prior to the extraction, by means of roentgenographic examination, etc., in order that we may show as a defense in these cases that every proper precaution was taken before it was decided to extract the tooth."

This probable future requirement of the courts is in line with their present demand that all dentists must progress with their profession[22]:

> They cannot cling to antiquated and abandoned methods, practices, remedies and appliances and escape liability for injuries resulting therefrom. . . . What was proper a few years ago may be malpractice today.

Another authority[1] is just as positive:

> A radiograph may be the best evidence that due care and diligence has been exercised in the treatment of the patient, and in many cases failure to have radiographs made has been the basis for legal action.

With most dentists, the mere statements of authorities carry considerable weight, but even they cannot command so much attention as the recent warning issued to policy holders by one of the largest insurance companies writing malpractice insurance[23]:

> The importance of x-rays in the diagnosis of any possible bone injury, and before and after reduction of fractures, cannot be overemphasized. It is becoming increasingly difficult to defend any such cases without full x-ray records.

Such a statement proves the necessity for routine roentgenographic examination, but does not show that such is the belief of the profession as a whole or at least the major part of it. The resolution passed by the Section on Pathodontia of the First District Dental Society of the State of New York, December 17, 1928, does indicate, however, the opinion of organized dentistry as to whether the use of the roentgenogram is demanded:

> WHEREAS: The officers and members of the Pathodontia Section of the First District Dental Society recognize the importance of the use of the x-rays as an aid in diagnosis, and during the process of treatment of pulpless teeth, and
>
> WHEREAS: Certain practitioners ignore this procedure, and,
>
> WHEREAS: Such practice is considered contrary to the best interests of the patient, be it therefore
>
> *Resolved:* That such procedure will be considered questionable practice in this branch of dentistry, and be it further
>
> *Resolved:* That this resolution be entered upon the minutes of this Section, and a copy be forwarded to the professional journals for publication, and also inserted in an early issue of the *First District Dental Society Bulletin.*

THE DENTIST'S RESPONSIBILITY

The law does not demand the highest skill of any practitioner of dentistry. It does, however, require that he use such reasonable and ordinary skill in the professional treatment of his patients as is common in his locality. But the fact remains that in order to be safe from malpractice suits, he is expected not only to keep up with the advances of his profession but also to gain in skill and judgment as his experience in practice increases. Brothers[24] states the whole requirement in one sentence: "The dentist must exercise that degree of care which an ordinary skillful, careful and prudent dentist would have exercised under the circumstances."

The two catch-words seemingly are "prudent" and "circumstances." According to the dictionary, "prudent" means

"circumspect in action," but it is obvious that the word "circumstances" can mean almost anything. For that reason, the prudent dentist will treat every case as though it may some day be brought into court—he will have a thorough roentgenographic record of every case.

There is still another aspect of dental responsibility. All legal authorities point out that the consent of the patient is necessary for any dental operation. Of course, the mere fact that he came to the dentist implies consent, but this cannot be assumed unless he voluntarily submits to a particular operation or course of treatment. In other words, he must be told what is thought to be best under the circumstances, and then, if he does not decline to have it done, assent can be implied. This is an important point in that patients some times refuse to have roentgenograms made in case an extra fee is charged. In such an event, the dentist may be without roentgenographic evidence to defend a malpractice action, should one be instituted.

Weston[8] points the way out of this difficulty, asserting you can be "protecting yourselves by demanding that a roentgenogram be taken preceding such extractions, in order that you may have definite evidence of the exact condition; and if the patient refuses or is unable to have such roentgenogram taken, then make such a refusal a matter of record."

Another effective course is to make roentgenograms whenever needed without charging an extra fee. Such a course of action automatically enables the dentist to do the work more easily and better, and also provides him with authentic permanent evidence of skilful work.

PREVENTION OF MALPRACTICE SUITS

Unquestionably, the most important legal aspect of the dental roentgenogram is that it constitutes in itself invaluable malpractice insurance. Any lawyer will hesitate to bring a case to trial if the dentist has good records backed up by preoperative, operative and postoperative roentgenograms. He will know in advance that such evidence would be difficult, if not impossible, to defeat and he will, therefore, hesitate. Instead, the plan of action might be to try to so intimidate the dentist that he would settle out of court. However, a dentist who has done his work carefully and who has comprehensive roentgenographic records should not be easily frightened, because he is armed with almost irrefutable evidence.

Michael Hayes, chief counsel of the United States Fidelity and Guaranty Company, in a recent talk before the Dental Staff of Unity Hospital in New York[25] urged his listeners to "make complete examinations of the mouth at all times, including x-rays, complete history and record charts." During the discussion, Hayes stressed the importance of proper cooperation between dentists and insurance companies. He urged the making of roentgenograms before and after every extraction.

Some may think that there is little danger of malpractice suits for the dentist at large, but "no one knows where lightning will strike." During periods of unsettled economic conditions, such actions multiply because the need for money causes some people to try means that they would never attempt in ordinary times.

Nor are all such suits even plausible, and some are almost absurd. In one case,[26] a woman charged that she suffered pain in her heart and other physical ailments because she had swallowed some of the anesthetic that accidently got in her mouth while a dentist was making an injection. Since people will sue on such trivialities, it behooves dentists to protect themselves in every way possible with good records. All authorities agree that the best defense against malpractice suits is their prevention.

Scott[27] has formulated a list of five rules that will help a dentist to avoid malpractice suits:

1. *Use tact.* Don't wait until trouble develops. Tell the patient frankly what you fear.

2. *Watch the relatives.* Bad feeling is traceable in an amazing number of cases to brusque treatment of some nosey but well-meaning relative.

3. *Keep records of everything.* Trial lawyers make much of slight omissions.

4. *Place the responsibility.* If you order radiographs and the patient demurs, then is the time—not later—to make a record of it. Write the patient a letter (and keep a carbon copy), reminding him that the responsibility will be his if the radiographic examination is not taken.

5. *Don't get excited.* One physician actually came to blows with the son of a patient, who had baited him into a quarrel.

A Michigan court covers this angle of prevention in a decision rendered in 1935[28]:

. . . in the event of a malpractice suit against a physician or surgeon, the x-ray negatives which he has caused to be taken and preserved incident to treating the patient might often constitute the unimpeachable evidence which would fully justify the treatment of which the patient was complaining.

One lawsuit is a good lesson in roentgenographic preparedness, but a poor way to get it.

CONCLUSION

The legal aspect of dental radiography is more important than the literature would indicate. Not only does it involve the use of roentgenograms as evidence, and their ownership, but also the responsibility of dentists to their patients.

Due consideration of the subject makes it conclusive that roentgenograms should be employed in every possible case, for they constitute the best known preventive of and defense in malpractice suits. All roentgenograms should be exposed and processed in an efficient manner, according to a standardized technic. This is fundamental, for the dentist as a witness then will be able to give a positive answer when questioned concerning technical data. Indefinite answers and poor memory always are damaging to a case.

All roentgenograms of a case should be placed in cardboard dental film mounts that provide space for the name and address of the patient and the date of examination, and should be filed permanently in fireproof cabinets so that they will always be readily available.

Only when all the dental schools have added to their curriculum a good course in radiodontic jurisprudence will the profession as a whole realize the importance of this aspect of dentistry. This course should present the subject to the student in such a manner that he will realize not only the value of the roentgenogram in diagnosis, but also its usefulness in preventing and defending malpractice suits. His teachers should present the legal importance of the roentgenogram so vividly that he would no more think of starting practice without easily available x-ray apparatus than he would of starting without an electric drill.

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343 State Street.

LEGISLATIVE COMMITTEE

THE MARYLAND DENTAL PRACTICE ACT

The American Dental Association has been advised that the Court of Appeals of the State of Maryland has rendered a favorable decision in an important case involving the Maryland Dental Practice Act. This act was passed by the state legislature in the Spring of 1937, but, before it became a law, persons opposed to it obtained the 10,000 signatures necessary to submit the bill to all the voters of the state for approval or disapproval.

The state legislative committee investigated a number of these signatures and discovered enough false ones to reduce the total number of valid signatures to less than 10,000. The committee brought to the attention of the local court the fact that the necessary number of valid signatures had not been obtained, and asked the court to grant an injunction restraining the supervisor of elections from placing the question of whether or not the law should be adopted upon the ballot for the November election. The judge's decision on this question was contested by the persons opposing the adoption of the Dental Practice Act and the case was taken to a higher court. This court, the Court of Appeals, rendered the present decision to the effect that the proper number of valid signatures was not obtained and therefore the voters are not entitled to decide the matter, and that the law is to take effect immediately, as was intended by the state legislature when the law was passed.

BUREAU OF PUBLIC RELATIONS

THIRTY YEARS' EXPERIENCE IN PROPHYLACTIC DENTISTRY

By Trim Houston, D.D.S., Corsicana, Texas

WHEN, a number of years ago, I assumed the responsibility for the dental care of the children in the Corsicana, Texas, orphanage, little did I realize that I was entering upon the Great Adventure of my professional life.

Previous to my undertaking the work, there had been no effort made toward really caring for the children's mouths. About the only attention given them was to stop a toothache when it became too bad—usually, an extraction. As one trustee, in all sincerity, said, "What's the use filling children's teeth, anyway? If you once start it, you have to keep it up as long as they live. If a tooth hurts, pull it out. That is what they did when I was a child." Of course, there was not a toothbrush in the home. Several of the older children, especially the girls, had already lost a high percentage of their posterior teeth. One of these older girls had seventeen cavities.

But since I was willing to undertake the work at comparatively little expense or trouble to the institution, through the good offices of the superintendent and the physician, who were fully appreciative of what I had in mind, as well as being my warm personal friends, I was allowed to dictate my own terms. These terms were: I and I alone was to have the say as to what should and what should not be done; I was to be allowed to enter the home for examinations whenever I saw fit, and they should bring such children as I designated to my office for attention, as I requested.

Thus the way was clear for me to try out, to the fullest, three, especially, considered at that time by many, "fool" notions. One was that children's mouths should have, if necessary, more careful attention than the mouths of adults; that all defects in the surface of the teeth should be cleaned out and filled, without waiting for actual decay to start, and that a child was better off, in the long run, to grow up with an appreciation of the fact that it was *his* job and not some one else's to keep his teeth clean and his gums firm and healthy.

To accomplish the first, I proceeded to examine each child's mouth at least once yearly and render whatever service was indicated. This was soon stepped up to twice yearly, with most gratifying results. For the second, every pit, fissure or recess into which I could pass a fine pointed explorer was cleaned out and filled. Thus, prophylactic odontotomy was practiced, most assiduously, from the beginning. As to the third, I instructed the matron to furnish the children brushes, plenty of water and table salt from the kitchen—nothing else. In turn, I kept off the teeth the tiniest flakes of tartar and stain, showing the child, as I did so, how he could and why he should reach those particular places better with his brush.

As a result, their every Saturday after-

noon engagement with me in my office—I generally see about five each Saturday—is the high spot in the week's work. The results have been more than gratifying.

During the, now, thirty years of this service, for the hundreds of children who have been in the home, only three permanent teeth, not past saving on entering, have been extracted as a result of decay; and thirteen nerves—not exposed on entering—have been destroyed. Of the children entering at 5 years of age or less, about two-thirds leave at past 18 years of age without having had a prophylactic odontotomy, much less having had decay in a permanent tooth. Occasionally, one of these grows up and is ready to leave the home without having had occasion to come to my office. And he feels that he has not had all that is coming to him. "Others have come in to have their teeth fixed." He "has been in the home ever since he was a baby" and I "have never done anything" for him.

And it's lots of fun to watch them grow—come up from next door to nothing, some of them, and go out healthy, hearty, well above the average physically, and mentally too, quite often. They come in at any age—up to 15—remaining till past 18. In all cases, the father, and in some, the mother has died. So, naturally, they as a rule have been, to say the least, improperly fed, housed and clothed previously to coming to us.

On entering, they are put in quarantine for two weeks, at least, to give any latent contagious diseases a chance to develop. The physician gives them a general going over, and starts correcting any ailments; so does the eye, ear, nose and throat specialist, and so do I. The nurse takes charge of any needing attention at her hands. If one needs any special diet, he gets it. If not, he is turned loose to feed himself to the limit of his capacity, at regular meal times—not cheap, soft sweets of any and every type at any and all times of the day or night, such as a high percentage of children are allowed to eat, but an all-round mixed diet, plain but most excellently prepared. Meat is served once a day; fruits and vegetables, fresh when possible, every meal; plenty of sweet milk; approximately 30 pounds of sugar a year for each child.

About the last of each month, I mail out to the superintendent a list of the children marked for examination and care during the next month. Then, within a day or so, I telephone for an engagement to go out for an examination, making note of those needing attention and posting those not needing attention to be examined again at the end of another six months; or less time, if there be need. And here is something you would not expect to find—a child made happy on being marked to visit the dentist, some even giving way to the temptation to malinger in order to get into the dental chair. Not that they are particularly eager to come to see me, but in case I find something needing attention, the child knows he is coming into town at least one Saturday afternoon during that month. We never have any particularly serious attention to give them, after the teeth are once in good shape; and they are perfectly willing to stand whatever may be necessary in order to make this, to them, excursion. My coming has been announced at the evening meal—they all know I am to be there. It is nothing uncommon for several of those not on that month's list to stop me going or coming from the examination room with "Doctor, please, I've got a loose tooth. Hadn't I better come in and have you pull it out?" "Doctor, I believe there is something awful wrong with my mouth. I don't know just what it is, but it doesn't feel right—hadn't I better come in to see you?" Or "Doctor, it's been an awfully long time since I was in to see you.

Haven't you lost my name?" Occasionally, they do need something; but nine times out of ten, they just want to come to town. And sometimes one will appeal to the superintendent shortly before time for the bus to start to town, complaining of tooth trouble. He has instructions to send these in, extra. Practically always they are "faking." And I have to report this fact to the superintendent once in a while, telling the culprit that I am doing so. If I didn't, he would pass the word on down the line; and I would have about as many extras as those who really need attention.

But one 15-year-old boy carried it too far. We followed him up. He would slip out of the office while the others were being cared for. We found he had a mania for paints and painting, of any kind whatsoever. A present of a box of water colors, with a promise of more to follow in case he behaved himself well, made a model patient and pupil out of him.

And after some time and effort at trying to locate an obscure, indefinite series of aches and pains about the mouth of a 16-year-old girl, we finally discovered, and she confessed it, that her real ailment was her heart. She had fallen in love, so she thought, with a boy working at a refreshment counter downstairs; and she used her pretended pain as an excuse to come in so she could smile at him as she passed. When the girl was informed by the matron that I had found out what her real trouble was, I heard nothing more from her.

One 9-year-old fellow had a mania for roller skating, and he had heard that there was a skating rink somewhere in town. A visit to the rink and a pair of skates for him to play around with cured his tooth troubles. And on and on and on—there is a never ending series of such incidents offering problems to solve, the ridiculous, the humorous, the foolish and, unfortunately, occasionally most pathetic.

A little 6-year-old girl climbed into the lap of a matron and asked if she believed in prayer. On being informed that the matron did, she said, with a hint of tears in her eyes: "Well, I used to, but I don't know now whether I do or not. There are two things I have been praying for for a long, long time, and it looks like neither one will ever happen. I have been praying every night for my mamma to come to see me, and for something to get wrong with a tooth, so I can go in to see Dr. Houston." This being reported to me, it is not necessary to say that she was on the list to come in the next Saturday. Trouble was found with a tooth and a coin to spend eased into her hand as she slipped out of the chair. The look she gave me was worth any man's hundred dollars.

The usual service rendered, after the child's mouth is in good condition, is a prophylactic odontotomy in a lower left first molar, lower right, upper left, upper right, lower left second, upper left second or upper right second molar in the order named; the removal of a temporary molar and the clearing away of tartar on the lingual surfaces of the lower incisors or stain on the labial surfaces of the upper incisors (in recent years, very few cases of green stain are seen), and then, occasionally, removal of slight tartar accumulations and stains on the buccal surfaces of the upper molars.

During the clearing away of these accumulations, the child's attention is called to the need of spending a little extra time on these particular spots. Let him understand that dereliction on his part has made these accumulations possible, that it is his duty and not my duty to see that his mouth is kept clean and healthy. Let him understand that proper brushing on his part should keep his mouth clean, just as proper bathing will keep his body clean. It is exhilarating indeed to see how enthusiastic these

children become over caring for themselves—not expecting some one else to assume this responsibility.

And it is not so much trouble as you would think to see that they use their toothbrushes.

In case a boy is not caring for his mouth, I report him to the matron who has him in charge. If, on seeing him again the next month, there is no improvement, I report the matron, not the boy, to the superintendent. It is not often that I have to report to the superintendent a second time. He doesn't care to be bothered with such details, and her job depends on her efficiency.

And it is almost awe inspiring to go out and examine mouth after mouth immaculately clean and healthy. Quite often, not one child is neglecting to do his part. One difference between the boys and the girls is that although the average girl gives no trouble whatever after she is 10 years old, the average boy needs watching till he is 15, when, almost overnight, he will become more particular than the most meticulously careful girl. He has become interested in the girls—usually one particular girl. At any rate, I know I shall have no more trouble with that boy about caring for his mouth.

We have approximately the same number of boys as girls. They eat the same food and get the same care at my hands. There is no difference in the living conditions in any respect. Yet I cannot say that the boys, in spite of the fact that, as a whole, they do not care for their mouths so well as the girls do, have more decay. The only way I can account for this is to suggest that since they eat their meals and get out of the dining room and the girls help as they do, "time about" in clearing away and washing the dishes, the latter have an opportunity to nibble bits of food, possibly sweet or soft stuff left over. Then too, the nights that they wash the dishes, they have less time to themselves and are more apt to neglect brushing their teeth before going to bed.

We see brown stain and mottled enamel, usually in children from western Texas. With the younger children, this often gradually fades out and is hardly, if at all, perceptible when they leave the home.

One family of eight had me puzzled. The two oldest and the three youngest had mottled enamel. The three between did not. On inquiring, I found that the oldest were born in western Texas, where artesian well water was used. The youngest were born in another section also having fluorine-tainted water; whereas the middle ones were born in a section of the state where surface water is used.

Though we have had only a few, the cases of congenital syphilis furnish intensely interesting cases for study and observation. Some have soft, spongy gums that bleed easily, and the administration of iodides brings about an almost miraculous cure. Some have ill-formed, poorly developed cusps, pits and fissures giving way almost overnight, with dirty dead white or almost grayish looking enamel. At the other extreme, perhaps in the same family, we find dark yellow dense enamel, with deep cusps; long prominent cuspids; and thick, ropy saliva, with sordes—an all-round repulsive, foul-smelling mouth. The iodides or any other antisyphilitic medicament will clear up this condition, too.

We have found that straight-sided or screwdriver upper central incisors and mulberry first molars are as pathognomonic of congenital syphilis as Hutchinson's teeth are given credit for being.

Noting such incisors in the oldest boy of a family of six led to the putting of his mother, a chronic invalid with no discoverable, direct reason for being so, on syphilitic treatment. Within a year, she had become so "rejuvenated" that she left and remarried. None of the children showed any ill effects of their inheritance

except the youngest girl, who grew up gross looking, with the typical saddle nose, and subnormal mentally.

Another 16-year-old girl developed an intractable iritis and was about to lose her sight. The ophthalmologist, noting mulberry molars, cleared up the eye condition with iodides.

A 9-year-old boy with straight sided upper central incisors developed a Vincent's infection which spread to the throat and up into the nose within forty-eight hours. A heavy dose of arsphenamine cleared up the condition.

We have had only one case of Hutchinson's teeth. The patient, a girl, had recurrent attacks of iritis beginning at puberty. Long-drawn-out antisyphilitic treatment finally put a stop to these attacks.

One boy with mulberry molars came in at about 14. From the beginning, he was incorrigible, a degenerate in every way. Finally, he disappeared. Had the signifiance of his mulberry molars been taken into consideration when he was a small child and the proper treatment administered, he might have made a useful citizen. These are just a few of the cases that we have been able to keep in touch with.

Do I have trouble with these children? Yes: they are not angels. Just average children. The most frequent difficulty is their wanting what they want when they want it—or not wanting to have it when they don't want it, a not uncommon human trait. For instance, a girl decides she will have her teeth cleaned—an excuse to get to come to town—or maybe she imagines she looks like some movie star. Probably she has boasted to the other girls as to what she can do, so she must do it. She will take something in her mouth—a piece of easily fading cloth or colored paper, eat some berries if they can be found, get hold of some licorice—just anything, then go to the superintendent and show him her badly stained teeth; and he, in all innocence, sends her in as an extra the next Saturday. Now, I have had to make a rule—which they sometimes forget about—that any one who thinks his teeth need cleaning before I have called for him must appear for the regular monthly examination at the home—not come in as an extra. So the girl is sent back home, with a reminder of this rule. She is called for examination the next time I go out. Invariably, the stain is all gone; but she has had her trip to town. In case she tries it a second time, I report her to the superintendent, telling her that I am doing so. That ends that trouble. But another schemer will turn up in her place, sooner or later.

A boy who has been in the home a comparatively short time needs to have his last baby molar extracted. As he takes his seat in the chair, he informs me he will let me do anything else I want to, but he will not let me pull that tooth. As my assistant brings a glass of water, I pry open his mouth and flip the offending molar out as I inform him in rather positive terms that what he wants or doesn't want means nothing to us, that what we are interested in is what he needs, and that he is going to get it. He is then dismissed for a month or so. On coming back, he is not reminded of our last seance. We do whatever is needed. He is not, at heart, a contrary youngster, but he has been allowed, before coming to us, to drift along as he pleased. From then on, we are the best of friends—I see to it that we are.

And let one have an accident, generally during a football game, that necessitates any work showing gold—then they come rushing in—chips off incisor edge, corners nicked off that were never thought of before suddenly become very important. Some even complain of aches and pains from these defects—they all simply want some gold in their teeth too.

Of those coming in at 5 years of age or less, not one has ever developed a con-

dition calling for orthodontic treatment. We have had one case of an impacted lower third molar and two of impacted upper third molars.

Going back to prophylactic odontotomy and the trouble it saves: Take, for instance, a lower left first molar, the first tooth in the mouth to decay: there will often be, on its eruption, a pit in the center. The chewing of any hard or coarse substance will be painful; as will contact with sweets as well as acids. A girl quickly learns not to use that side, consciously or unconsciously. Granting that she brushes her teeth regularly and carefully, there will be, as a consequence of the disuse, a lack of the additional cleansing effect of food passing over not only this molar, but also the other teeth on that side. There will be insufficient stimulation to both teeth and gum tissue; also a lack of quantity as well as quality of the saliva on that side of the mouth. As a consequence, there will be a certainty of decay in that molar, and a far better chance for decay in the upper first molar, lower second bicuspid, lower second molar, upper second molar and upper second bicuspid, and then the first bicuspid on that side, in the order named. All this extra hazard for these teeth would be avoided if this first molar was treated by a prophylactic odontotomy, taking probably fifteen or twenty minutes of time, with no real punishment to the patient.

Another thing noted after a child has been in the home a year or so is that he practically never has approximal decay. The average is less than one approximal cavity per year. This we ascribe to the lack of soft, sweet, sticky, clinging foods between meals, and no soft drinks, which the average child has frequently.

The usual afternoon's engagement is something like this: Say we have five patients to see, taking the girls first. One girl, aged 15, has a pit in the palatal surface of the upper right second molar and the buccal surface of the lower left second molar; another, aged 12, a slight tartar on the lingual surfaces of the lower anterior teeth and stain on the labial surfaces of the upper anterior; another, aged 11, an upper right second temporary molar to be extracted; a boy, aged 16, just becoming "tooth conscious," tartar and stain on the buccal surfaces of upper first and second molars and lower anterior teeth lingually and slightly labially, and a pit in the occlusal surface of the upper right second molar; another, aged 10, a pit in the occlusal surface of the lower right first molar and a lower left second temporary molar and upper right first temporary molar to be extracted. That is an average engagement with children who have been in the home for two years or more. Another boy, aged 6, an "extra," comes strutting in, feeling his importance in getting to come to see the dentist. He has a front tooth to be taken out. He takes up about ten minutes, the greater part of which is spent in spitting in that pretty bowl that goes round and round, while he confides to me that he would have come in sooner, but that other tooth just fell out before he could ask the matron about coming in to see me.

As for the three extracted permanent teeth mentioned earlier: one, a lower left second molar, erupted in such a position that it would never be fully useful, was extracted on the chance that the third molar would move forward into a better position, and it did. In the two other cases, a lower left first and upper right first molar, a girl, 15 years old, would go into a state of collapse, practically, within three minutes after taking a seat in the chair. With a general anesthetic, taken most satisfactorily, the teeth were extracted. She was an intelligent girl, valedictorian when she graduated. But here is a chance for the believer in the fallacious theory of prenatal impressions. The mother related that during the pregnancy with this

child, her third within four years, she had to have several badly broken down abscessed teeth extracted. A traveling tooth puller, with kitchen chair and dirty, rusty, filthy forceps, with no anesthetic, dug and gouged, pulled and crunched, till she was "ready to faint."

The thirteen nerves destroyed were from recurrent decay under large occlusal-approximal fillings. Perhaps I should have destroyed these or extracted the teeth in the beginning, immediately after their arrival in the home.

Two-thirds of those coming in under 5 years go out without any defects. I can ascribe this only to the general care, outdoor life, plain wholesome abundant food, with plenty of milk, and the care they give their mouths from the time they know how.

Here are statements as taken from our records, which show the end-results of this kind of attention.

FROM REPORT MADE JUNE 1, 1930

Of the 938 children, 210 came in at from 1 to 6 years of age. Of these 210 children, 153 went through the home without needing fillings in the permanent teeth. For the other fifty-seven, 144 fillings were placed in permanent teeth, practically all these being on the buccal surfaces of the lower molars and the occlusal surfaces of the lower and upper first molars.

For 428 children who came in at from 7 to 12 years, 737 fillings were placed in permanent teeth.

For 300 children who came in at from 12 to 15 years of age, 423 fillings were placed in permanent teeth.

FROM REPORT MADE MAY 3, 1935

We dismissed from the home, for this year's graduating class, twenty-nine; eighteen girls and eleven boys, who came in at from infancy up to 15 years of age. They are now 18. From the second year after each entered the home, the services needed have been: permanent teeth extracted, none; permanent tooth nerves destroyed, none; cervical cavities, none; approximal cavities, one. (This girl entered at 12 years of age and at 14 a distoclusoproximal cavity was found in a lower left second bicuspid.)

Pit and fissure fillings numbered forty-one. (Fully 65 per cent of these were prophylactic odontotomies.)

FROM REPORT MADE MAY 30, 1936

Thirty-three 18-year-old boys and girls were discharged. They entered at from 1 to 15 years—average 9 years.

There were no extractions of permanent teeth and no nerves killed; no gingival, labial or lingual cavities. There was one approximal cavity in the mesial surface of the upper right central incisor of girl who entered at 14 years of age.

FROM REPORT MADE MARCH 24, 1938

About 75 per cent of fillings by prophylactic odontotomy were placed in the permanent teeth of seventy-five children coming into the home at 5 years of age or under, and remaining until past their eighteenth birthday.

Approximately 25 per cent (by prophylactic odontotomy) were placed in the permanent teeth of seventy-five of the children coming into the home at 14 years of age or over and remaining with us until after their eighteenth birthday.

For the children coming in at 5 years or under:

Number needing no fillings	50
Number needing fillings	25
Total	75
These fillings were:	
Occlusal	27
Buccal	3
Approximal	0
Gingival	0
Labial	0
Lingual	0

Palatal	0
Total	30

For the children coming in at 14 years of age or over:

Number needing no fillings	0
Number needing fillings	75
Total	75

These fillings were:

Occlusal	171
Buccal	30
Approximal	75
Gingival	0
Labial	1
Lingual	0
Palatal	6
Total	283

This procedure, owing primarily to the appreciation of its value by Thaddeus P. Hyatt, more than anyone else, has been officially indorsed by the American Dental Association, Canadian Dental Association, International Dental Association and about forty state and local dental societies. It is the simplest, easiest—both on patient and operator—most worthwhile service possible. Its value should be appreciated and it should be put into practice by all dental practitioners.

THE CALIFORNIA STATE DENTAL ASSOCIATION DEDICATES MAY-JUNE JOURNAL TO DENTAL HEALTH

THE May-June 1938 issue of the *Journal of the California State Dental Association* gives other state and component society journals a preventive dentistry goal to shoot at.

Captioned the "Dental Health Issue," it contains contributions from authorities throughout the country on "Dental Health for American Youth"; "Does Maternal and Infant Welfare Present a Dental Problem?"; "Milk"; "Heredity"; "The Life We Live"; "Child Health: Our Nation's Greatest Asset"; "National Internal Defence"; "We Are What We Eat"; "Better Health for the Gums"; "Home Care of the Teeth and Mouth"; "Your Child's Teeth"; etc.

Articles by Drs. Camalier, McCall, Charbonnel, Hambly, Brauer, Dwyer, Drain, Boyens and others, excellently illustrated with photographic reproductions, make this a most worthwhile contribution to preventive dentistry. Congratulations.

HARVARD OFFERS PUBLIC HEALTH COURSE FOR DENTISTS

THE School of Public Health and the Dental School of Harvard University announced the opening in September 1938 of the second year of the course in public health for dentists. Courses of a general public health nature, plus others designed specifically for the dentist, are included in the year's work. Fulfillment of the requirements of the various courses will lead to the degree of Master of Public Health or to the certificate in Public Health.

DENTAL ECONOMICS

HEALTH SERVICE AND SOCIAL SECURITY

THE House of Delegates of the American Medical Association met in special session for the third time in its history, September 16-17, 1938 at Chicago. The meeting was called for the purpose of considering the national health program submitted to the National Health Conference recently held in Washington and such other matters as were submitted to the House of Delegates by the Board of Trustees.

Representatives of the American Dental Association were in attendance upon the request of Dr. Olin West, Secretary of the American Medical Association.

The House of Delegates carefully analyzed the national health program and unanimously passed the following resolutions:

REPORT OF REFERENCE COMMITTEE ON CONSIDERATION OF THE NATIONAL HEALTH PROGRAM

DR. WALTER F. DONALDSON, Chairman, presented the report of the reference committee, which, as amended, reads as follows:

Since it is evident that the physicians of this nation, as represented by the members of this House of Delegates convened in special session, favor definite and decisive action now, your committee submits the following for your approval:

1. Under Recommendation I on Expansion of Public Health Services: (1) Your committee recommends the establishment of a federal department of health with a secretary who shall be a doctor of medicine and a member of the President's Cabinet. (2) The general principles outlined by the Technical Committee for the expansion of Public Health and Maternal and Child Health Services are approved and the American Medical Association definitely seeks to cooperate in developing efficient and economical ways and means of putting into effect this recommendation. (3) Any expenditures made for the expansion of public health and maternal and child health services should not include the treatment of disease except so far as this cannot be successfully accomplished through the private practitioner.

2. Under Recommendation II on Expansion of Hospital Facilities: Your committee favors the expansion of general hospital facilities where need exists. The hospital situation would indicate that there is at present greater need for the use of existing hospital facilities than for additional hospitals.

Your committee heartily recommends the approval of the recommendation of the technical committee stressing the use of existing hospital facilities. The stability and efficiency of many existing church and voluntary hospitals could be assured by the payment to them of the costs of the necessary hospitalization of the medically indigent.

3. Under Recommendation III on Medical Care for the Medically Needy: Your committee advocates recognition of the principle that the complete medical care of the indigent is a responsibility of the community, medical and allied professions and that such care should be organized by local governmental units and supported by tax funds.

Since the indigent now constitute a large group in the population, your com-

mittee recognizes that the necessity for state aid for medical care may arise in poorer communities and the federal government may need to provide funds when the state is unable to meet these emergencies.

Reports of the Bureau of the Census, of the U. S. Public Health Service and of life insurance companies show that great progress has been made in the United States in the reduction of morbidity and mortality among all classes of people. This reflects the good quality of medical care now provided. Your committee wishes to see continued and improved the methods and practices which have brought us to this present high plane.

Your committee wishes to see established well coordinated programs in the various states in the nation, for improvement of food, housing and the other environmental conditions which have the greatest influence on the health of our citizens. Your committee wishes also to see established a definite and far reaching public health program for the education and information of all the people in order that they may take advantage of the present medical service available in this country.

In the face of the vanishing support of philanthropy, the medical profession as a whole will welcome the appropriation of funds to provide medical care for the medically needy, provided, first, that the public welfare administrative procedures are simplified and coordinated; and, second, that the provision of medical services is arranged by responsible local public officials in cooperation with the local medical profession and its allied groups.

Your committee feels that in each a system should be developed to meet the recommendation of the National Health Conference in conformity with its suggestion that "the role of the federal government should be principally that of giving financial and technical aid to the states in their development of sound programs through procedures largely of their own choice."

4. Under Recommendation IV on a General Program of Medical Care: Your committee approves the principle of hospital service insurance which is being widely adopted throughout the country. It is susceptible of great expansion along sound lines, and your committee particularly recommends it as a community project. Experience in the operation of hospital service insurance or group hospitalization plans has demonstrated that these plans should confine themselves to provision of hospital facilities and should not include any type of medical care.

Your committee recognizes that health needs and means to supply such needs vary through the United States. Studies indicate that health needs are not identical in different localities but that they usually depend on local conditions and therefore are primarily local problems. Your committee therefore encourages county or district medical societies with the approval of the state medical society of which each is a component part, to develop appropriate means to meet their local requirements.

In addition to insurance for hospitalization your committee believes it is practicable to develop cash indemnity insurance plans to cover, in whole or in part, the costs of emergency or prolonged illness. Agencies set up to provide such insurance should comply with state statutes and regulations to insure their soundness and financial responsibility and have the approval of the county and state medical societies under which they operate.

Your committee is not willing to foster any system of compulsory health insurance. Your committee is convinced that it is a complicated, bureaucratic system which has no place in a democratic state. It would undoubtedly set up a far reaching tax system with great increase in the cost of government. That it would lend

itself to political control and manipulation there is no doubt.

Your committee recognizes the soundness of the principles of workmen's compensation laws and recommends the expansion of such legislation to provide for meeting the costs of illness sustained as a result of employment in industry.

Your committee repeats its conviction that voluntary indemnity insurance may assist many income groups to finance their sickness costs without subsidy. Further development of group hospitalization and establishment of insurance plans on the indemnity principle to cover the cost of illness will assist in solution of these problems.

5. Under Recommendation V on Insurance Against Loss of Wages During Sickness: In essence, the recommendation deals with compensation of loss of wages during sickness. Your committee unreservedly endorses this principle, as it has distinct influence toward recovery and tends to reduce permanent disability. It is, however, in the interest of good medical care that the attending physician be relieved of the duty of certification of illness and of recovery, which function should be performed by a qualified medical employee of the disbursing agency.

6. To facilitate the accomplishment of these objectives, your committee recommends that a committee of not more than seven physicians representative of the practicing profession, under the chairmanship of Dr. Irvin Abell, President of the American Medical Association, be appointed by the Speaker to confer and consult with the proper federal representatives relative to the proposed National Health Program.

Respectfully submitted,
WALTER F. DONALDSON, *Chairman*
WALTER E. VEST
H. J. LUCE
FRED W. RANKIN
FREDERIC E. SONDERN

COMMITTEE TO CONFER AND CONSULT WITH PROPER FEDERAL REPRESENTATIVES

Dr. H. H. Shoulders, Speaker, appointed the members of the Committee to Confer and Consult with Proper Federal Representatives, as follows:

Drs. Irvin Abell, President of the American Medical Association, Chairman; Walter F. Donaldson, Pennsylvania; Walter E. Vest, West Virginia; H. A. Luce, Michigan; Fred W. Rankin, Section on Surgery, General and Abdominal; Frederic E. Sondern, New York; E. H. Cary, Texas. Drs. Rock Sleyster, President-Elect, and Olin West, Secretary, were declared by the Speaker to be members of this committee, ex officio.

A PLANNED HOSPITAL INTERNSHIP FOR THE DENTAL GRADUATE

By Samuel Cartin, D.D.S., New York City

THE question of compulsory hospital internships has been a frequent topic in the dental literature. In my judgment, dental internships, like postgraduate instructive courses, should be entirely optional. Such an association for the recent dental graduate so far surpasses the virtues of apprenticeship that with the advantages and opportunities of the internship properly pictured, the decision as regards this option is a foregone conclusion. Unless the graduate is prepared to spend numerous years with a general practitioner or a specialist, apprenticeships are impractical and unsatisfactory to both parties. If the dental profession is to retain its proper place in the field of medicine, it must realize that a few years spent in the study of theory and fundamentals does not qualify the dentist to be a consultant to the physician. No matter how many more years may be added to the dental curriculum, the best that can be expected is the teaching of fundamentals and of theories. The proper place to learn to appreciate the medical and surgical aspects of dentistry is either in postgraduate study or through hospital internships.

This paper will be devoted to a presentation of personal experiences with a hospital internship which has proved practical in that it teaches the graduate the relationship of dentistry and medicine. In the last analysis, only by training and research in the hospital clinics and laboratories can dentistry hope to advance to its due status in medicine.

In 1917, M. Hillel Feldman, of New York City, organized one of the first, if not the first, dental internship in a general hospital, with maintenance within the hospital and full professional equality with the medical intern on a non-salary basis. Other institutions may have had paid full-time resident or non-resident dentists on the staff, but this appears to have been the beginning of the modern dental internship as far as I have been able to discover. From a humble beginning, the dental department has evolved into a service consisting of two full-time interns, an extern and twenty-eight attending dentists. The attending staff is divided into these categories: (1) chief-of-staff, (2) associate attending dental surgeon, (3) assistant attending dental surgeon and (4) clinical assistant dental surgeon. The department averages more than 16,000 visits a year. The ward census indicates well over 9,000 patients a year. With such a large outpatient and inpatient service, the interns have a sufficient number of clinical patients.

The internship in dentistry offered at the Lincoln Hospital in New York City might serve well as a model in planning dental outpatient departments as well as in planning the training to be given to the intern. Although the operative clinic was disbanded a number of years ago because of the tremendous growth of the surgical clinic, the intern may use the facilities of the clinic to obtain operative experience on the nursing and medical intern staffs. A prosthetic clinic meets every Thursday afternoon and is supervised by an attending dentist, under the department of social service. It is never allowed to become so rushed as to pre-

vent the intern from developing his technic or from experimenting along some new trend such as that of immediate dentures. Through association with an attending periodontist, the intern has the opportunity of a year of practical training in periodontoclasia under qualified guidance.

The oral surgery clinic meets five mornings a week. It is furnished with the latest in dental equipment. Six chairs are available, including one for x-ray examinations and one for general anesthesia. The latter are quartered in rooms of their own. The anesthesia room is equipped for ethyl chloride, nitrous oxide and divinyl ether anesthesia. Both the McKesson and the Gwathmey type apparatus are available for use.

After the patients are registered, their charts are given to a clerk whose duty it is to have the patient sign a consent for operation at each visit. The signed charts are then given to the clerk of the clinic whose duty it is to assign the patients to the chairs as they are emptied. His duty also includes discharging the patients and recording the procedures with the name of the surgeon on the chart. The clerk who secured the patient's signature for consent completes the discharge of the patients by either telling them that they are dismissed or making a further appointment. The dentist orally dictates his procedures to the clerk of the clinic. A nurse is in charge of the clinic. Her duties, of course, are obvious.

Prenatal patients are examined by the intern every Tuesday afternoon as they register for the first time. Those patients needing surgical care are referred to the dental outpatient department. Those needing operative care are referred to social service. By the time the patient is admitted to the obstetric ward, all sources of oral foci of infection have been eradicated.

In his daily ward examination, the intern is intimately in contact with every patient. The dental needs of the patient are recorded on a special dental chart and included in the case history. Those patients requiring surgical procedures are recommended for treatment. After consultation with the house physician, one of three procedures is followed: The patient may be transferred to the outpatient department for treatment; or, if deemed advisable, the operation is performed in the ward; or it may be considered best to delay dental procedures until a later date. The chief-of-staff is notified of all consultations and nothing is done until he has seen the case or has given permission as to the dispensation of the case. The dental department acts in the capacity of consultant, proceeding with treatment only after consent has been given by the surgical department. The dental staff ranks in its consultant capacity on a par with the consultation service of the gynecologic, ear, eye, nose, throat, medical and surgical services.

One intern remains on call throughout the day and night for emergency cases. In the emergency room, first-aid treatment only is permitted. Patients are referred to the outpatient department should they require surgical care. Patients whose condition requires hospital care are admitted to the wards after consultation with the admitting physician. On the wards, the patient is given a complete physical examination by the surgical staff. The chief-of-staff of the dental department as consultant examines the patient. Although there are no "dental beds," patients admitted to the surgical ward for dental care are turned over to the dental department for treatment.

Through his contacts in the many different departments of the hospital, the intern is able to learn medical terminology and technic and to acquire poise as well as medical and surgical judgment. His association with the medical interns cements a closer understanding between the medical and the dental profession. During the discussions regarding diagnosis and treatment, the dental intern has

the opportunity to add his opinion regarding possible oral sepsis and its effects on the patient. Septic temperature and signs of lowered resistance or of impending disaster without apparent systemic cause find the dental intern and the medical intern in consultation. Often, such cases react favorably to the removal of a focus of infection located in the mouth.

In the afternoon and evening and on Saturday morning, the intern has the opportunity to become familiar with operating room procedures. Where else but in the operating room can the dentist learn to appreciate the true meaning of surgery and be able to understand his field, the oral cavity? Here in the operating room, the intern is in close contact with the surgeons, the anesthetists and the nursing staff. He becomes familiar with the many different kinds of surgical instruments and the many different kinds of sutures, with the many different ways of tying sutures, of properly making an incision, of inserting a drain, of closing a wound, etc. He becomes aware of the skill, patience, dexterity and gentleness that make for ability and confidence. His relations with the anesthetists give him the opportunity to learn general anesthesia. He is taught how to administer open-ether, nitrous oxide-oxygen and gas-oxygen-ether anesthesia. He has the opportunity to observe spinal, intravenous and cyclopropane anesthesia. Unquestionably, this contact broadens his understanding of anesthesia. After he becomes qualified as an anesthetist, he is expected to assist the tonsillectomy and circumcision teams as the anesthetist.

The chief-of-staff of the dental department does not ride any anesthetic hobbies or advocate surgical peculiarities and so gives the intern the opportunity to learn sound exodontic and surgical procedures. It is possible for the intern to find one member of the staff with a particular aptitude for some special branch of dentistry, perhaps gold foil, denture, amalgam, inlay, root therapy, photography or x-ray. By placing himself under the guidance of that dentist, he can learn a great deal in his year of internship.

Since the intern is in charge of the x-ray apparatus, he must, early in his career, learn how to take intra-oral as well as extra-oral films. He must develop them and learn to make the first tentative diagnosis. His x-ray knowledge is further enhanced through his association with the hospital technicians and with medical diagnosticians, all of whom give freely of their time and knowledge. The accessibility of thousands of roentgenograms on file, as well as of the special case films and the diagnostic records, gives the intern opportunity for extensive roentgenogram study.

The facilities of the bacteriologic and pathologic laboratories are at his disposal. He may send specimens to the pathologic laboratory and slides to the bacteriology department for reports. He may, if he wishes, familiarize himself with the technic of urinalysis, blood counts, blood typing, smear examination, etc. He can, if he wishes, carry out all the procedures that fall to the lot of the junior medical intern.

The intern is thoroughly grounded in the fundamentals of local and general anesthesia. He is made to realize that a simple needle technic is more than enough for his needs, although he is given every opportunity to use any recognized block or infiltration technic which he may wish to study. Under the supervision of the chief-of-staff, as well as those attending who are qualified as anesthetists, the intern becomes versatile in the administration of ethyl chloride, nitrous oxide and oxygen, as well as divinyl ether. After he has become qualified, which takes about six months, the responsibilities of the general anesthesia room are shifted to him.

Under the diversified guidance of so many in attendance, all of whom are more than eager to teach the intern, he

becomes confident and proficient. As his ability becomes known, more and more responsibility is given him. Because of his ward training, his training in anesthesia and his daily attendance, the intern becomes the hub around which the clinic revolves. Since every patient in the clinic must come under his observation he is able to study every case from the time the patient is first seen to the time he is discharged.

The offices of the members of the dental staff may be visited and by observing these men in their offices and by discussions with them, the intern enriches himself with the finer qualities of their personalities and with their office procedures. By carefully keeping case records and by faithfully noting his observations, the intern at the termination of his internship will have acquired a tremendous amount of information for future reference. Within the hospital, there are many opportunities for clinical research. The writing of a paper on a dental clinical research problem is one of the requirements of the internship. Should the paper merit publication, two copies are permanently filed in the library of the hospital.

A certificate of internship as well as a qualification certificate in anesthesia is presented to the intern after completion of his internship. He leaves the hospital at the end of his training, confident of his ability and well prepared in the fundamentals of exodontia and oral surgery, as well as in local and general anesthesia.

A dental internship should be optional, with particular stress on the subjects which cannot be properly taught to undergraduates. These subjects include anesthesia, local and general, x-ray interpretation, exodontia, oral surgery, diagnosis, technic and treatment, as well as surgical and medical judgment. True, in the internship discussed, the field of operative dentistry has been completely disregarded. No issue is taken with those who would develop more of the mechanical phases of dentistry. For the profession to continue to advance, it must encourage the creation of more dental hospital internships.

730 Fifth Avenue.

THE AMERICAN MEDICAL ASSOCIATION SURVEY

We are in accord with the spirit of cooperation with the medical profession in all health problems; but we are finding it a little difficult to become enthused about the dental aspects of the proposed A.M.A. Survey. This may be due to the fact that dental care is relegated to a comparatively small part in the A.M.A. Survey setup.

Why, we ask, wasn't the dental profession consulted in the preparation of the questions relating to dental care? And why should a survey of dental care be delegated to the county medical society? We fully appreciate the need of making a survey of dental care in Wisconsin, but it must be more than "just another survey." This survey should be so extensive that it will present a true picture of dental care in the state, and also result in the accumulation of valuable factual data.

The State Medical Society has, during the past year, conducted an extensive survey of medical care in the state (having levied an assessment of $10.00 per member to secure funds for that purpose). Following this, the State Medical Society sent its executive secretary to Europe for four months, to make a study of medical practice in European countries. In addition to this, the Medical Society has, for the past seven years through its Committee on Institutional Care, made a survey of medical care in state institutions.

These efforts of the State Medical Society have undoubtedly resulted in the accumulation of important factual data and suggest the thought that the proposed survey will but serve as a supplementary survey of medical care in Wisconsin.—E. C. W., in *J. Wisconsin State D. Soc.*, August 1938.

STUDIES ON DENTAL CARIES. 1. DENTAL STATUS AND DENTAL NEEDS OF ELEMENTARY SCHOOL CHILDREN*

DENTAL caries is generally recognized as a physical impairment which exceeds in prevalence all others known to occur in children in the United States. Although many methods have been tried for the control and prevention of caries, none has been accepted other than replacement of the carious tooth structure by chemically stable filling materials.

The need for the development of new methods of control has led to a detailed study of dental disease in a representative urban community. This paper presents the results of a dental survey of essentially the entire elementary grade-school population of a community. The results strongly suggest that a redistribution of dental services is indicated if school children, who represent approximately 15 per cent of the entire population, are to receive adequate and effective care.

GROUP SURVEYED AND METHODS

Hagerstown, Md., whose grade-school children were studied, has about 30,000 inhabitants (1930). In general, the population is representative of the broad middle range of socio-economic groups in the United States. In the spring of 1937, 4,416 out of 4,700 grade-school children were given dental examinations by dental officers of the U. S. Public Health Service.

The dental examinations were made with No. 3 plain mirrors and fine pointed pig-tail explorers under favorable lighting conditions. Observations were made on all teeth present in the mouths and, in addition, the number of unerupted and extracted permanent teeth was noted. Teeth designated as carious were those which showed actual, though frequently small, cavities. The extent of caries in any single tooth was measured in terms of tooth surfaces involved. Filled surfaces were considered as past carious surfaces. Full crowns were considered equal to five surfaces affected by past caries.

DENTAL NEEDS

The term "dental needs" is restricted to define those professional requirements which are directly and obviously the immediate consequence of dental caries. Under this definition, tooth defects which constitute dental needs are contributed by present unfilled cavities in the deciduous and permanent dentitions and by missing permanent teeth.

In the 4,416 children observed, 2,331, or 53 per cent, have one or more unfilled carious deciduous teeth. Of a total of 24,940 deciduous teeth present in the mouth, 9,943 have unfilled cavities, which involve 21,191 tooth surfaces. Nearly 40 per cent of the deciduous teeth present, therefore, contain unfilled cavities.

In the permanent dentition, the conditions which, together, constitute dental needs as defined in this report include all teeth with clinical histories which indicate untreated defects due to caries. The conditions which fall into this category come under actual unfilled cavities, remaining roots and missing permanent

*Extracts from a paper (in Pub. Health Rep., August 19, 1938) by Henry Klein, D.D.S.; Carroll E. Palmer, M.D., and John W. Knutson, D.D.S., associate dental officer, past assistant surgeon, past assistant dental surgeon, respectively, United States Public Health Service, Washington, D. C.

teeth. Of the 4,416 children examined, a total of 2,617, or nearly 60 per cent, require one or more fillings in the permanent teeth. A total of 7,989 permanent teeth require the treatment of 11,802 tooth surfaces by fillings. Additional details of the status of dental needs show that a total of 330 permanent teeth have remaining roots which require extraction and that a total of 1,219 permanent teeth are missing (extracted). When these are combined (9,538 teeth), it is indicated that 76.6 per cent of all teeth giving a clinical history of caries must be considered in a broad discussion of the problem of dental needs in the permanent dentition.

FILLINGS IN THE PERMANENT AND DECIDUOUS TEETH

The data previously presented indicate that all except a very small segment of a representative elementary school population shows attack by caries in the permanent teeth and that approximately three-fourths of all teeth attacked give no objective evidence of treatment. Furthermore, an analysis of the distribution of reparative treatment indicates that a relatively small group of children receive all of the treatment given, yet only one-half of their needs are supplied.

ANALYSIS

The data just presented offer quantitative support for the frequently encountered observation that defects due to dental caries in childhood constitute a health problem of major proportions.

Caries in the permanent teeth of children 6 years of age may be viewed as an accumulation of defects which have been added each year up to age 6. Carious defects at 7 years of age may be considered equal to those which have accumulated at age 6 plus the increment of new defects which have appeared between the sixth and seventh years of age. From this point of view, a total yearly increment of defects for the entire elementary school population may be interpreted as a reasonably accurate measurement of new carious defects which appear each year in the population of school children. When this method is applied to the Hagerstown group, the results indicate that 5,859 carious tooth surfaces represent the estimated increment of new defects in the permanent teeth which may be expected to appear each year in a representative group of 4,416 school children. Thus, it would appear that the problem of controlling the initiation of dental defects is the problem of eliminating these yearly increments.

If the dentists in the community were filling approximately 1,000 permanent tooth surfaces a year, it would result in the finding of 4,282 filled surfaces at the time of the survey, which was the approximate number found. Since approximately 6,000 permanent tooth surfaces develop caries each year, it becomes apparent immediately that the filling of permanent tooth surfaces is being accomplished at a rate which is about one-sixth of the rate at which defects are developing.

First, it seems necessary to conclude that the magnitude of the present accumulation of dental needs in the permanent teeth alone is of such order as to make exceedingly difficult its immediate practical handling with existing facilities. Second, it seems reasonable to expect that provision should be made for handling the yearly increment, the care of which is estimated to require approximately 10 per cent of the professional time of the thirty-two dental practitioners of the city. Third, care for the yearly increase in new defects appears to involve a sixfold increase over the time now given to the filling of permanent teeth in school children.

SUGGESTIONS FOR PROVIDING MORE NEARLY ADEQUATE DENTAL CARE

Assuming that it is highly desirable to prevent the accumulation of untreated

defects, and that each dentist would be willing to assume a proportionate share of the professional labor involved, during the first year of operation, complete dental treatment should be supplied for all carious defects in the permanent teeth of all children in the first grade of the elementary schools. During the succeeding years, complete care would be provided for caries appearing in the permanent teeth of all new first-grade children and for the new carious defects appearing in the higher grade pupils who were treated the preceding year. After the operation of the plan for eight years, all grades of the elementary school population will have received, systematically, treatment for the yearly increment of defects.

EXCERPTS FROM ECONOMIC COMMITTEE REPORTS

NEW YORK STATE

A general survey made by the New York State Dental Society during the early part of 1938 disclosed the following interesting facts:

Average cost of equipment, $5,260.

Average amount of money due, $2,510.

99 per cent enjoyed the practice of dentistry.

1 per cent did not.

For 70 per cent, dentistry was the only source of income.

30 per cent had other sources of income.

85 per cent recalled patients periodically.

15 per cent did not.

75 per cent employed assistants.

25 per cent did not, but may have had hygienists.

50 per cent employed hygienists.

50 per cent did not.

15 per cent employed no help whatever.

95 per cent owned x-ray equipment.

5 per cent did not.

100 per cent owned sterilizers.

80 per cent in Seventh District did not approve of state dentistry.

Figures from New York State as a whole indicate that:

54.2 per cent do not approve of health insurance, of federal or private ownership.

45.8 per cent do approve.

19.6 per cent approve of federally controlled health insurance.

80.4 per cent approve of private ownership.

70 per cent did not approve of state dentistry.

30 per cent did approve.

For adults, 20 per cent.

For children, 31.8 per cent.

For indigents, 48.2 per cent.

Statistics from the Second District Dental Society of New York reveal the following figures:

65 per cent of the dentists in this area employ assistants.

5 per cent employ assistants and hygienists.

5 per cent employ hygienists only.

3⅓ per cent employ assistants and technicians.

1⅔ per cent employ both hygienists and technicians.

1⅔ per cent employ technicians only.

18⅓ per cent reported that no help whatsoever is employed.

Composite figures would show that:

73⅓ per cent employ assistants (2,200)

11⅔ per cent employ hygienists (350)

6⅔ per cent employ technicians (200)

That is, 2,750 persons have gainful occupation in dental offices in the area of the Second District Dental Society of New York.

CONNECTICUT

There are approximately forty-eight clinics operating in Connecticut at the present time. These clinics function for both children and adults. The total number of visits made by children last year to these clinics was 114,168. The number of visits made by adults was 31,361. The clinics are governed by many types of agencies and financed from various sources. They employ 154 dentists and forty-five hygienists. Twenty-three are directed by dentists, four by physicians, three by health officers, two by registered nurses and fifteen by lay persons. The forty-eight clinics have a total of ninety dental chairs. Twenty-nine make no charge for their services and nineteen make a minimum charge. The types of service rendered are largely diagnosis, prophylaxis, local anesthesia, extraction, relief of pain and amalgam and synthetic fillings. Three clinics offer denture service. Ten offer oral surgery, two crown and bridge work and two orthodontia.

GEORGIA

The 1937-1938 survey conducted by the Georgia State Board of Health in cooperation with the state dental society shows that 33⅓ per cent of Georgia school children had been to the dentist within the past year.

During the school year of 1937-1938, 215,000 children in 1,018 schools in 128 of 159 counties were examined by members of the state dental society. The survey revealed that:

57 per cent of the children had visited a dentist one or more times during their lifetime.

37 per cent had been to the dentist within the last year.

88 per cent owned toothbrushes.

69.8 per cent had cavities, an average of four per child.

NEWS ITEMS OF INTEREST

NEW YORK STATE CONSTITUTIONAL CONVENTION ACCEPTS HEALTH INSURANCE

After bitter debate on Thursday night the Constitutional Convention now being held in the State of New York to revise the state constitution accepted an amendment, which, if the proposed constitution is adopted by the voters, will permit a legislature to establish a system of health insurance. The amendment was adopted by a vote of 84 to 66.

This grant of power was then incorporated in a proposed social welfare article to the new state constitution.

The convention had previously rejected the proposal for health insurance by a vote of 61 to 60. But Thursday night, with practically full attendance from the Democratic delegates, the word "sickness" was placed back in the article. The article reads in part that the legislature might provide for "the protection by insurance or otherwise against the hazards of unemployment, sickness and old age."

Of the 84 voting for health insurance, 59 were democrats and 25 were republicans, and of the 66 voting against the proposal, 62 were republicans and 4 democrats.—Association of Medical Cooperatives News Release, August 23, 1938.

THE HOUSEWIFE VIEWS HEALTH CARE

The women of America went on record in favor of group health insurance in a national survey on "What the Women of America

Think About Medicine" just published in a national magazine.

Sixty-six per cent would, if given the opportunity, support some plan whereby for about $3.00 a month, a medical association would provide all necessary doctor and hospital service for themselves and their families. A majority of the women also believe the government should provide free medical care for people with limited incomes and meet the cost from taxes, that free medical care should be given to school children and that the state should provide maternity care for mothers who cannot themselves pay for it.

Fifty-two per cent of the women said that doctors' bills were too high. There was a disparity here, however, between the income groups, a majority of these with incomes under $1,500 a year, 61 per cent believing that doctors charge too much, while only 41 per cent of the women in the over $1,500 a year income group thought so. While a majority of the women believed doctors' bills to be excessive, they said these charges had not kept them from medical care which had been necessary for them or their children.—*Duluth (Minn.) Tribune,* August 14, 1938.

MICHIGAN HEALTH CONFERENCE

Lansing will be the scene September 10 of a state-wide health conference to "muster support behind a federal health program."

Governor Murphy pointed out that Michigan may be selected by the federal government as the starting point of a new health program and that health officials at Washington had communicated with him frequently regarding new developments in the state program. Surgeon General Thomas Parran, head of the federal health service, may be a speaker at the conference, it was indicated.

Medical profession representatives, as well as representatives of labor groups, farmers and other organizations will be invited to participate in the conference, according to the governor.

"The conference," said the governor, "will approach its deliberations from the point of view of the person who needs medical attention or treatment. Group health insurance, group medicine and area clinics will be among the subjects discussed. The goal is to make possible the best medical attention both to the indigent and to persons of moderate means.—*Lansing Journal,* August 16, 1938.

CLEVELAND MEDICAL INSURANCE PLAN

Directors of Cleveland's Academy of Medicine stepped into the middle of the "socialized medicine" discussion today with a plan through which employed persons could pay $7 to $9 a year to insure themselves against a maximum of $126 in doctors' bills incurred in the course of hospitalization.

The plan, designed solely to cover serious diagnoses, accidents or illnesses, would benefit only those patients sent to hospitals. It also would be restricted to members of the Cleveland Hospital Service Association. This organization, the academy said, "now has more than 100,000 subscribers to whom 21 days of hospital service is furnished in any one year for a prepayment of $7.20 to $9 annually" under a program described as "ethical, actuarially and socially sound."

The academy's proposal would provide, for matching fees, similar medical service benefits—payment at $6 a day for a maximum of 21 days. Total fees thus would run around $15 to $18 a year, and potential benefits $252.

Hospital Service Association serves principally persons with incomes from $1,000 to $2,600 a year, those upon whom it considers the burdens of illness fall heaviest. For additional fees a member may obtain benefits for his family—even including obstetrical care after the one year's membership.

The academy is affiliated with the American Medical Association, which has opposed some health service plans on the ground that nothing should be allowed to come between a physician's personal dealings with an individual patient.—*Indianapolis, Ind. Star,* September 10, 1938.

CURRENT LITERATURE

Healing of Fractures of Atrophic Bones

By J. Goisman and E. L. Compere

The authors attempted to determine whether fractures of atrophic bones united at the same rate as those of normal bones. Rats were used as experimental animals and low calcium, stock and high vitamin D diets were used. Repair of fractures in animals fed low-calcium diets progressed to the same stage of complete bony union and at the same rate as those fed a normal stock diet. However, the total amount of bone laid down in repair was less, and new trabeculae and cortices were thinner. Addition of excess vitamin D to either diet did not increase the rate or degree of the healing of fractures. The conclusion is drawn that "there is no good evidence that the addition of vitamin D or calcium to the average stock diet of experimental animals or to the well-balanced diet of patients has any beneficial effect in the healing of fractures."—*J. Bone & Joint Surg.*, **20**:587, 1938.

Frank Allen.

Clinical Studies of Paradentosis in Diabetes

By F. Hilming

In a study of sixty-five cases, sixty-one patients showed paradentosis. It is concluded that diabetes predisposes one to this condition, especially when acidosis is present. Dietary histories showed that the most severe cases occurred in those forbidden milk. Loss of calcium may be a factor also in the production of paradental disease.—*Hospitalstidende*, **81**:213, 1938; abstr. *Nutrit. Abstrs. & Rev.*, **8**:212, 1938.

Martin Deakins.

Vincent's Infection—Therapy

By T. Wood

On the premise that pure soap in a 0.5 per cent solution is the best contact spirocheticide, the author recommends it in the treatment of Vincent's infection. He states that this solution should be used hot, at fifteen to sixty minute intervals, with sufficient agitation to force it into the crypts and interproximal spaces.—*M. Times*, **66**:374, 1938.

Martin Deakins.

Lactobacillus Acidophilus and Dental Caries

By Philip Jay

Lactobacillus is invariably associated with dental caries. The ingestion of large amounts of sugar causes caries and a parallel increase in lactobacillus, even with nutritionally adequate diets. Conversely, restriction of the sugar intake inhibits caries even with inadequate diets, thus affording an effective treatment for the disease. Caries is not related to nutritional adequacy of the diet. Mineral and vitamin preparations are ineffective in arresting caries.—*Am. J. Pub. Health*, **28**:759, 1938.

Abstractor's note: One may profitably compare this with the abstract of McBeath and Zucker's paper (J.A.D.A., **25**:1360, August 1938).

Martin Deakins.

Clinical Course and Treatment of Sprue

By D. K. Miller and W. H. Barker

An abstract is made of only that portion of a paper on the clinical course and treatment of sprue dealing with oral manifestation and the treatment. The study included a series of thirty-three patients, ten presenting the classic picture of sprue, with diarrhea, anemia and oral manifestations. The oral symptoms included recurrent soreness of the tongue and mouth, extending, in nine cases, over periods varying from one to fifteen years, and beginning at the onset of the gastro-intestinal symptoms. Two types of mouth involvement and pain were noted: one, a redness and burning of the tongue; the other, an ulceration of the buccal and gingival mucous membrane, accompanied at times by involvement of the whole oral cav-

ity. Predominating oral lesions at the time of admission were (1) atrophy of the lingual papillae, (2) redness of the tongue and oral mucosa and (3) vesicular and ulcerative lesions of the tongue and mucous membrane. Six of the patients had atrophic glossitis, and one, aphthous lesions on the tongue. Treatment consisted of rest in bed and a diet high in protein and low in carbohydrate and fat, with liver extract given parenterally. In most cases, recurrence of symptoms followed deviation from the diet.—*Arch. Int. Med.*, 60: 385, September 1937.

FRANK ALLEN.

Mucous Cysts of the Lower Lip

By M. DICHAUME and S. DABKEVITCH

IN a report of several cases of mucous cyst of the lower lip, the authors noted that the cyst was confined to the lip in the region of the lower cuspids, halfway between the free margin of the lip and the mucolabial groove. It appears on the mucous membrane as a small swelling, limited in size, and bluish, which differentiates it from the surrounding oral membrane. The cyst gives little pain and may burst, exuding a clear thick stringy fluid. The authors consider the condition due to trauma of a mucoid cavity content in the neighborhood of the salivary glands. Treatment is excision and suturing. —*Rev. de Stomatol.*, 40:93, February 1938.

B. J. FREY.

Acute Infectious Gingivostomatitis (Vincent's Stomatitis)

By W. C. BLACK

THE term "acute infectious gingivostomatitis" is proposed for Vincent's stomatitis occurring in children. It is characterized by marked gingivitis, oral fetor, fever and enlargement of the regional lymph nodes. The cause is unknown. The fusiform bacillus and spirillum probably play a subordinate rôle. In sixty-nine cases studied, it was found that the hardy and well kept child is affected as commonly as the malnourished and dirty, the condition occurring more frequently in the fall and winter. The incidence is about twice as high in girls. The age incidence peak is about 30 months and in most cases the condition develops before the fourth year. Fever is one of the first manifestations. The gingivitis and oral fetor reach their peak after the constitutional symptoms have subsided. The duration is usually from nine to fifteen days and it is mildly contagious. Debilitated children or those suffering from measles should be protected from exposure to this disease.—*Am. J. Dis. Child.*, 56:126, July 1938.

L. H. GARRISON.

Subacute Bacterial Endocarditis Following the Removal of Teeth or Tonsils

By L. FELDMAN and I. M. TRACE

THIRTY-SEVEN references are reviewed which deal specifically with the causation of bacterial endocarditis. It is concluded that "septic foci" in the mouth and upper respiratory passages are regarded as undoubted portals of entry and should be eliminated as a prophylactic measure in people with valvular or congenital heart disease. Five cases are presented by the authors wherein subacute bacterial endocarditis apparently had arisen as a result of operative trauma attending the extraction of septic teeth or the removal of tonsils. Such a procedure probably offered an opportunity for a transient bacteremia caused by the nonhemolytic streptococcus in most cases. More intelligent investigation of patient history is urged.

VIRGIL D. CHEYNE.

Agranulocytosis Following the Ingestion of Causalin

By HENRY JACKSON, JR.

AGRANULOCYTOSIS has followed the administration of aminopyrine, dinitrophenol, organic arsenicals, gold salts and sulfanilamide. The serious nature of this disease makes it imperative that no drug of this sort be administered unless there is urgent need and proper indication. When such chemicals are given, the physician should be constantly on the watch for the development of leukopenia.

Two cases of agranulocytosis have recently been seen in which the etiologic agent appears to have been causalin, a drug made up of approximately equal parts of aminopyrine and hydroxyquinoline and widely advertised for the treatment of rheumatism. In one case, physical examination was essentially negative except for the palate and fauces, which were red and dry and partially covered with a whitish membrane. The temperature was

102.4 F. and the white blood cell count 1,200 per cubic millimeter. The patient was given pentnucleotide, 40 cc. daily, but the blood picture remained the same and she died sixty hours after admission. In the second case reported, the patient noticed a small ulcer on her tongue, which was treated with silver nitrate. The ulcer, however, continued to spread, and one week before admission, the patient had a fever of 102. The white blood cell count was 1,600 per cubic millimeter, red blood cell count 3,830,000 and hemoglobin 63 per cent. This patient also received pentnucleotide intramuscularly. The ulcerations of the tongue spread to the chin and the areas became necrotic. The slough continued until there was an opening 5 cm. in diameter through the entire wall of the cheek into the buccal cavity.

Eight days after the initiation of pentnucleotide therapy, however, the white blood cell count began to rise and clinical improvement was noted. The ulcers healed slowly and the blood picture gradually returned to normal. The inherent dangers of causalin, containing as it does both aminopyrine and a quinoline derivative, should be borne in mind. Indeed, there would appear to be no excuse for its administration.

M. K. Hine.

Electrosterilization of Root Canals

To the Editor: Could you give me any information concerning ionization treatment? I am particularly interested with regard to its use for the treatment of dead teeth.

Answer. Ionization, or electrosterilization as it has sometimes been called, was introduced in dentistry in the early years of the present century. It created a great wave of enthusiasm and machines were manufactured by the hundreds by dental supply houses, but it almost immediately faded out. It is probable that the reason for such a prompt and complete failure was that most of the members of the dental profession were not sufficiently trained in chemistry, biology and physics to make intelligent use of the apparatus. Bad effects were frequent and rather serious in some cases and the whole process went into disrepute. A few men continued, however, and have used the method successfully for twenty-five years or more.

The method depends on the separation of molecules into their ions; positive ions move in an electric current to the negative pole and negative ions move to the positive pole. By this method antiseptic and germicidal chemicals can be carried into the tissues to reach areas of infection not accessible from the surface. It is clear that such a method requires a good background in chemistry, physics and biology for its successful application. Chemicals that will destroy bacteria have a more or less deleterious effect on tissue cells and it is quite easy to destroy not only the bacteria, but also the tissue cells, making the situation worse rather than better. The recent method employed in treating such conditions as infections around the apexes of tooth roots has tended strongly in the direction of removing the source of bacterial infection and leaving the tissues to fight out the battle with the bacteria by means of their own defense mechanisms. It is, however, probably possible by intelligent use of this method to kill bacteria in the tissues and at the same time stimulate the tissues and their defense mechanisms.—Queries and Minor Notes, *J.A.M.A.*, 111:274, July 16, 1938.

M. K. Hine.

Hemiatrophy of Jaw

To the Editor: A girl about 15 years of age has an inequality in the development of the lower jaw. One side is slightly smaller than the other. So far as I can learn there is no definite known cause for this. I would appreciate some information as to the probable cause and the treatment, if any.

Answer. Hemiatrophy is a perplexing problem, as its etiology is obscure. It is usually confined to the face either as a whole or principally to the areas supplied by the individual branches of the fifth nerve. There is at times a history of a forceps delivery, but there is little evidence that forceps injury can be the actual cause.

In one case the mother had atrophy of the left side of the face but no other pathologic condition except a malocclusion of the teeth, while her daughter, aged 6 years, had not only typical atrophy of the left side of the face but also an adhesion of the tongue to the mandible and side of the pharnyx, the left arch of the palate being elevated by the attachment.

Atrophy in general may be from malnutri-

tion, senility, disuse or pressure, but hemiatrophy, whether localized in the face or a complete hemiatrophy of the body, seems to present more evidence of a neuropathic influence. Atrophy of the side of the face occurs at times in lesions of the fifth nerve, in some cranial lesions and in wasting of the skeletal muscles in destruction of the anterior cornu of the spinal cord.

Thyroid has been mentioned as being beneficial, but in most such cases improvement seems to be quite hopeless.

Benjamin Feinsilver and Herman M. Rosow reported a case of total hemiatrophy in *The Journal,* January 29, page 366, and gave a bibliography up to 1932.—Queries and Minor Notes, *J.A.M.A.,* 111:85, July 2, 1938.

M. K. Hine.

Microscopic Study of the Surface Enamel of Human Teeth

By M. J. Eisenberg

A histologic study of the surface enamel was made of fifty extracted teeth. Under low power magnification, no structural detail of enamel rods was discernible. Instead, ripple marks were observed over the entire surface except where they may have been obliterated by masticatory abrasion. Under higher magnification, these marks have the appearance of waves with the crest breaking directly toward the neck of the tooth. Except for the incisal tip enamel, rods are visible over practically the entire surface. The prevalent rod-end shape is hexagonal. For small distances over the cuspal prominences, the rod surfaces may be exposed lengthwise. Islands that show no rod detail (now reflective enamel) are visible in many instances.—*Anat. Rec.,* 71:221, June 1938.

S. B. Finn.

Vitamins

The attention of all persons interested in vitamins should be called to a series of special articles which have been appearing in the *Journal of the American Medical Association,* prepared under the general auspices of the Council on Pharmacy and Chemistry and the Council on Foods. These authoritative articles are to be published later in book form. A partial list of those already printed follows:

Clausen, S. W.: Pharmacology and Therapeutics of Vitamin A. (Includes 154 references.) *J.A.M.A.,* 111:144, July 9, 1938.

Munsell, Hazel E.: Vitamin A—Methods of Assay and Sources in Foods. (Includes 67 references.) *J.A.M.A.,* 111:245, July 16, 1938.

Luce-Clausen, Ethel M.: Clinical Aspects of Ultraviolet Therapy. (Includes 43 references.) *J.A.M.A.,* 111:311, July 23, 1938.

Coblentz, W. W.: Physical Aspects of Ultraviolet Therapy. *J.A.M.A.,* 111:419, July 30, 1938.

Nelson, E. M.: Determination and Source of Vitamin D. *J.A.M.A.,* 111:528, August 6, 1938.

Skohl, A. T.: Physiology and Pathology of Vitamin D. *J.A.M.A.,* 111:614, August 13, 1938.

Jeans, P. C., and Stearns, G.: Human Requirement of Vitamin D. *J.A.M.A.,* 111:703, August 20, 1938.

M. K. Hine.

Grinding Teeth in Child

To the Editor: A little girl, aged 4½, who seems in splendid health, has acquired the habit of crunching or gritting her teeth while asleep, especially when she lies on her back. I have consulted various books but find no mention of this condition. Could you please tell me the cause of such a condition and treatment?

Answer. The exact cause for grinding or gritting of the teeth has not yet been determined. The condition, however, seems to occur most frequently in children of so-called neuropathic constitution. These children, as a rule, are restless and irritable, and they sleep more or less poorly. The condition in itself does not result in any damage to the teeth in the majority of instances, nor does it seem to have any detrimental effect on the health. With increasing age, the disorder, in almost every instance, disappears. Treatment should be directed toward the reduction of the child's nervousness, by assuring an opportunity to obtain plenty of rest, sleep, fresh air and sunshine. Calcium therapy given concurrently with vitamin D preparations is suggested in some cases.—Queries and Minor Notes, *J.A.M.A.,* 111: 866, August 27, 1938.

BIBLIOGRAPHICAL

Operative Dentistry

By C. N. Johnson, M.A., LL.D., L.D.S., D.D.S., M.D.S., F.A.C.D. Dean of Students and Professor of Operative Dentistry in the Chicago College of Dental Surgery, Loyola University; Editor of The Journal of the American Dental Association. National Medical Book Company, Inc., New York City. 1938. Price $3.00.

This book is one of a series of national dental monographs being published by the National Medical Book Co., under the Editorship of Dr. C. N. Johnson, and is the forerunner of the series that will cover the subjects of operative dentistry, prosthetic dentistry, oral surgery, orthodontia, periodontia, children's dentistry, etc.

The opening chapters are on dental anatomy and dental caries, in which the author emphasizes the desirability of attaining the goal of prevention, and notes that failure to attain it makes it necessary that the largest part of dental practice be devoted to operative dentistry as the nearest practical approach to prevention. The author devotes most of the monograph to a consideration of the various materials used for filling teeth, and, as we would naturally expect, the greater part of the remarks on filling materials to gold-foil as the heritage of operative dentistry which has yet to fail the conscientious and skilful operator. Filling materials and methods come and go, but gold-foil placed by the old-fashioned malleting method seems to be the one that goes on forever. The author was for many years a leading exponent of and an expert in gold-foil operative procedure.

This book does not attempt to cover the endless minutiae of technics in the operative field, but it does present the latest views on and methods of cavity preparation, filling materials and their manipulation, etc., illustrated in well chosen illustrations. This book should not be confused with Johnson's "Operative Dentistry," long known as one of the leading texts on the subject, the present book only undertaking such treatment of the subject as is allowed by the monograph style.

As a unit of a pretentious effort to cover all phases of dentistry, "Operative Dentistry" will fully serve its purpose.

The History of Dentistry in Missouri

This book comprises a brief summary of early dental history, American dental activity and the advance of dentistry in Missouri. It includes a survey of the dental organizations within the state, and their code of ethics, dental laws and local publications. It contains biographic notes on the founders and presidents of the Missouri State Dental Association and dentists from the districts outside St. Louis and Kansas City districts. The material was compiled and published under the direction of the History Committee of the Missouri State Dental Association, with the financial aid of the guarantors. Fulton, Missouri: The Ovid Bell Press, Inc., 1938. Price $6.00.

The title page of this book, as quoted above, tells in condensed form the motif of the book. It does not, however, in the nature of the case, tell the story of the enthusiastic and sustained efforts of the compilers over a period of years, which have been rewarded by a book that not only establishes for all time the enviable place of Missouri in the pioneer development of dentistry in the West, but also reflects great credit on the perseverance of the present generation in gathering, assembling and recording the story of those pioneer efforts.

Although that portion related to general history is of necessity brief, it is sufficiently full to make clear the motivating spirit which enabled Missouri to take a conspicuous and leading part in the national development of dentistry and left a heritage of accomplishment which is being instilled into the present generation.

We have always endeavored to emphasize the importance to the present generation of a knowledge of the lives and ideals of our forefathers; to emphasize that every dentist

will be a better dentist with that knowledge, and that an appreciation of the heritage left us will enable us to attain the lofty ideals held by those who struggled untiringly that we might the better bear the professional standards.

The record of dentistry in Missouri is most complete. There is a historical record of the life and activities of every local and district society, the honorable record of the St. Louis Dental Society, one of only two dental societies that have enjoyed a continuous existence of over eighty years and are still active today. There is also a complete record of the Kansas City Society, which is one of the oldest and most active societies in the state; a full record of the state society and a complete record of the activities of almost every member in the local and state societies.

We have long felt that every state society should compile a complete history of its life story, and Missouri here presents a fine example, worthy of emulation by all state societies. We would confidently predict such an agreeable eventuality if every state society could have such an enthusiastic, self-sacrificing and industrious history committee as the one which produced this book.

Although the entire committee deserves much praise for the accomplishment of such a worthy undertaking, we are pleased to note particularly the efforts of Dr. Haverstick, whose untiring zeal and enthusiasm deserves, and we are sure will receive, the unstinted praise of all those who have been associated with the effort.

Every dentist in Missouri and in every other state of the Union should possess and read this signal effort toward establishing a proper appreciation of the history of our profession.

We note particularly a full and complete index to this history, which greatly facilitates reference to the many biographies and other interesting historical records here compiled.

A Text-Book of Dental Histology and Embryology Including Laboratory Directions

By Frederick Bogue Noyes, B. A., D.D.S., Sc.D., F.A.C.D., Professor of Histology, Northwestern University Dental School, 1896-1914; Professor of Histology and Orthodontia, College of Dentistry, University of Illinois, 1914, Dean, 1927. Fifth Edition, Revised and Largely Rewritten by

Isaac Schour, B.S., D.D.S., M.S., Ph.D., Professor of Histology and Head of Department, University of Illinois, College of Dentistry, and

Harold Judd Noyes, B.S., D.D.S., M.D., Clinical Assistant, Pediatric Department, Rush Medical College, 1935; Associate 1936; Assistant Pediatrician on Staff at Presbyterian Hospital, 1936; Research Associate, Walter G. Zoller Memorial Dental Clinic, University of Chicago, 1937.

284 illustrations and 15 plates. Philadelphia: Lea & Febiger, 1938. Price $6.50.

Noyes' book on histology, for many years one of the leading texts on the subject, has been the principal reliance for the latest conceptions of dental histology. The present book has been largely rewritten, as is practically necessary with each new edition of a work on this subject. For many years, dental histology has been probably the most discussed subject in the dental field, and students have been much confused by the diversity of opinions on practically every essential histologic interpretation. Several decades ago, however, the entrance of the Gottlieb school into the dental histologic field signalized a new era of facts as related to the histology of the various tooth structures. The Gottlieb school settled many moot histologic questions and marked an approach to the subject that gives promise of converting the least understood subject of the dental curriculum into the best understood one. That time has not yet arrived, but with the productive efforts of the modern histologists, we believe we can almost see the promised eventuality.

Noyes has, during his many years as author, been impelled to revise his text to conform to newly discovered facts, and in this edition he has been ably assisted in bringing the book up to date by Dr. Schour, whose work in this field has added substantially to the accurate knowledge of the subject. Harold J. Noyes has contributed notably to the embryologic phase of the subjects embraced in the title.

The illustrations, some in color, add materially to the understanding of the complex phases of this subject as well as to the appearance of the book. As an example of the bookmaker's art, the book is well up to the standard of the publisher.

Index of the Periodical Dental Literature. 1933-1935

Compiled by Arthur D. Black, Chicago: American Dental Association. 1938. $7.50.

Another volume of the Dental Index covering the years 1933-1935 has recently come off the press. This index classifies the major articles in English from more than one hundred dental publications, including journals published in Canada, England, Australia, New Zealand and the United States. The style of the index has been modified somewhat in this volume, the name of the magazine following each title of an article instead of being listed before the reference, as was formerly done. In the back of the book is a personnel index which includes under the name of the author all articles published by him during the period covered by the index, biographic sketches, obituary notices, etc. Authors can keep track of their published works through this index. This is the last volume to be completed under the direction of Dr. Black, whose untiring efforts made possible dental indexes covering in their entirety almost one hundred years of dental literature.

J. P. H.

Lehrbuch der konfervierenden Zahnheilkunde

By Hans H. Rebel, Munich: J. F. Lehmanns, 1938.

This book, a concise presentation of modern methods of operative dentistry, includes information on the latest methods of cavity preparation, wax manipulation, porcelain, treatment of pyorrhea and root canal treatment, quoting extensively from American authors. It is an interesting book and worth while for those who read German readily, though it does not present anything which American readers cannot get from American textbooks. It is adequately illustrated and contains a good index.

W. J. K.

BOOKS RECEIVED

Textbook of Bacteriology

By Thurman B. Rice, A.M., M.D., Professor of Bacteriology and Public Health at the Indiana University School of Medicine. Second edition, revised. Philadelphia and London: W. B. Saunders Company, Publishers, 1938. Price, cloth, $5.00.

Internal Medicine in Dental Practice

By Bernard I. Comroe, A.B., M.D., F.A.C.P., Instructor in Medicine, Schools of Medicine and Dentistry in the University of Pennsylvania, Philadelphia; Leon H. Collins, Jr., A.B., M.D., F.A.C.P., Associate in Medicine in the University of Pennsylvania School of Medicine; Instructor in Medicine in the University of Pennsylvania School of Dentistry, Philadelphia; Secretary, Commission for the Study of Pneumonia Control of the Medical Society of the State of Pennsylvania, and Martin P. Crane, B.S., M.D., Instructor in Medicine in the Schools of Medicine and Dentistry of the University of Pennsylvania, Philadelphia; Visiting Physician to the Misericordia Hospital, Philadelphia; Chief Coroner's Physician, Philadelphia. Illustrated with 44 engravings and a colored plate. Philadelphia: Lea & Febiger. 1938. Price $4.00.

A History of Dentistry

By Arthur Ward Lufkin, D.D.S., Assistant Professor of Dental History in the College of Dentistry, University of Southern California, Los Angeles, California; Editor of the *Journal of the Southern California State Dental Association*. Illustrated with 90 engravings. Philadelphia: Lea & Febiger. 1938. Price $2.75.

ST. LOUIS, HOST TO AMERICAN DENTISTS
OCTOBER 24, 25, 26, 27, 28, 1938

AMONG the events taking place the week of the American Dental Association meeting will be a concert by the U. S. Navy Band, which is making its centennial tour, on Navy Day, October 27, at the St. Louis Municipal Auditorium, with matinée and evening performances. There will be a comprehensive exhibit of Naval floating and Naval aviation equipment. A naval dress parade, a colorful spectacle, will also be part of the program. The Navy Band continues to delight the world with its glorious music.

The symphony orchestra season officially opens in St. Louis October 28-29. The St. Louis Symphony Orchestra will inaugurate the 1938-1939 season with two concerts scheduled for Friday afternoon and Saturday night, October 28 and 29.

The symphony orchestra personnel numbers eighty-seven. The conductor, Mr. Golschmann, has announced the engagement of soloists and preeminent artists in several fields of music expression. The orchestra enters its fifty-ninth year this season. It is the second oldest symphony orchestra in America.

Historians give due credit for the part taken by and the influence of the St. Louis Symphony Orchestra in the history of music in America.

Those attending the A.D.A. convention will greatly enjoy these concerts.

One of the most talked of dramas of last season in New York, "On Borrowed Time," will be seen at the American Theatre in St. Louis the week of October 23, when the Annual Session of the American Dental Association will be held in the Missouri metropolis. Paul Osborn's dramatization of Lawrence Edward Watkins' popular novel of the same name is an enjoyable stage offering.

The original Broadway cast, which was highly praised for perfection in acting, will be seen in the St. Louis engagement, including Dudley Digges, famous screen and stage star, in the rôle of the fumbling and shaggy grandpa. Other members of the brilliant cast are Peter Holden, Dorothy Stickney, Frank Conroy, Peggy O'Donnell and Jean Adair.

The plot is admirably unfolded. It is a fantastic treatment of death. The play centers around a pair of grandparents and a little boy whose parents have left him a decent estate. The grandparents strive to save the boy from losing his rightful inheritance by keeping death out until he comes of age.

"On Borrowed Time" opened in New York last February and is scheduled to run through September. The company opens a long transcontinental tour immediately after its final New York performance. St. Louis is one of the early cities on the road itinerary to see this stage success.

The Grand Opera Playhouse will open October 15 with a New York stock company presenting such plays as "Three Men on a Horse," "Room Service" and "The Women."

The football teams of the two local universities are members of the Missouri Valley Conference and games are to be played on dates during or near the American Dental Association meeting as follows: October 21, at 8 p.m., St. Louis University plays Grinnell at Walsh Stadium. October 22, at 2:30 p.m., Washington University plays Missouri University at Francis Field. October 29, at 2:30 p.m., Washington University plays Centre College at Francis Field.

American Dental Association

St. Louis, Missouri October 24-28, 1938

HOTEL RESERVATIONS

To secure hotel accommodations for the 1938 Session, consult the rate list and fill out the attached blank. Mail this immediately to the hotel of your first choice or to the Housing Committee, Room 108, Hotel Statler, St. Louis, Mo. Confirmation will be sent to you by the hotel.

Second and third choices of hotel should be indicated. If the reservation cannot be made at any of the hotels of your choice, the Housing Committee will place you in as favorable a hotel as possible and will notify you.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations you desire. If you find it impossible to carry out your part of the contract, namely, to occupy the room at the time agreed upon, please write or wire the hotel releasing the room, in order that it may be available for other members.

RAILROAD FARES TO ST. LOUIS

Because of the reduced regular rates and round-trip fares, there is no longer any arrangement for convention rates and, therefore, there will be no convention certificates available as in the past. The new low rates for passage in Pullmans and the lower rates for travel in coaches will be in force. Summer excursion rates will be available from some sections of the country. Inquire of your station agent as to the most economical fare.

APPLICATION FOR HOTEL ACCOMMODATIONS

AMERICAN DENTAL ASSOCIATION

St. Louis, Mo. October 24-28, 1938

HOTEL.....1st choice

HOTEL.....2nd choice

HOTEL.....3rd choice

Kindly reserve the following:

.....Rooms with bath for.....persons $.....per room

.....Rooms without bath for.....persons $.....per room

Arriving on October.....at.....a.m.....p.m.

ROOMS TO BE OCCUPIED BY:

NAME	ADDRESS IN FULL
.....	.....
.....	.....
.....	.....

NOTE TO HOTEL NAMED AS FIRST CHOICE: If the hotel of first choice is unable to make the reservation requested, this application should be forwarded at once to the Housing Committee, Room 108, Hotel Statler, St. Louis, Mo.

SCHEDULE OF RATES

ALL ROOMS WITH BATH*

Hotels	*Single*	*Double*	*Twin Beds*
AMERICAN 6 North 7th St.	$2.50	$4.00	$5.00
AUDITORIUM 1803 Pine St.	2.50	3.50	4.50
BILTMORE 3643 Washington Blvd.	1.50	2.50	3.00
CHASE 212 N. Kingshighway Blvd.	2.50–3.00–3.50–4.00 Apartments (4 persons), 12.00	4.00–5.00–6.00	5.00–6.00
CLARIDGE 18th and Locust St.	2.00–2.50–3.00	4.00–4.50–5.00	4.00–4.50–5.00 6.00
CONGRESS 275 N. Union Blvd.			6.00
DESOTO 1014 Locust St.	2.00–2.50–3.00	3.00–3.50–4.00	3.50–4.00–5.00 6.00
CORONADO 3701 Lindell Blvd.	2.50–3.00–3.50 4.00–4.50–5.00–6.00 Parlors (wall beds), 5.00, single; 6.00, double 2 room suites (3 persons), 7.50 Parlor suites, 5.00 6.00–7.00–8.00–9.00 10.00–11.00–12.00	3.50–4.00–4.50 5.00–6.00	4.00–4.50–5.00 5.50–6.00–7.00
FAIRGROUNDS 3644 Natural Bridge Blvd.	2.00–2.50	3.00–4.00	
FOREST PARK 4910 W. Pine Blvd.	3.00 Apartments (2-4 persons), 3.00 person		4.00–6.00
GATESWORTH 245 Union Blvd.	3.00 Suites (4 persons), 8.00	4.00	5.00

*Extra cot, $1.00. Rates on rooms without bath on request.

SCHEDULE OF RATES (Continued)

Hotels	*Single*	*Double*	*Twin Beds*
JEFFERSON 415 North 12th Blvd.	$3.00–3.50–4.00 4.50–5.00–5.50 Suites (single), 6.00 8.00–10.00–17.50 Suites (double), 8.00 12.00–19.50	$4.00–4.50–5.00 5.50–6.00–7.00 7.50	$5.00–6.00–7.00 7.50–8.00
KINGS-WAY 108 N. Kingshighway Blvd.	2.00–2.50–3.00–3.50 Suites, 5.00–6.00–7.00 8.00	3.00–3.50–4.00	4.00–5.00–6.00
LENNOX 825 Washington Ave.	3.00–3.50–4.00	4.50–5.00–5.50 6.00	5.00–5.50–6.00 6.50–7.00
MAJESTIC 200 North 11th St.	3.00	4.00–5.00	6.00
MARK TWAIN 116 North 8th St.	2.00	3.50–4.00–4.50	4.50–5.00–5.50
MARQUETTE 18th and Washington Blvd.		3.00	4.00
MARYLAND 205 North 9th St.	2.50	3.50–4.00	4.00–4.50
MAYFAIR 8th and St. Charles St.	3.00	4.50–5.00–5.50 6.00–6.50–7.00	5.50–6.50
MELBOURNE 3601 Lindell Blvd.	2.50–3.00–3.50–4.00	4.00–4.50–5.00 6.00	4.50–5.00–6.00 7.00
PARKEDGE 4907 W. Pine Blvd.		4.50	6.00
PARK PLAZA 220 N. Kingshighway Blvd		5.00	6.00
ROOSEVELT 4901 Delmar Blvd.		3.00 (shower only)	
STATLER 9th and Washington Blvd.	2.50–3.00–3.50–4.00 4.50–5.00 Parlor (wall bed), 7.00 single; 9.00 double Parlor suites (2 or 4), 15.00–22.00	4.50–5.00–6.00 6.50–7.00	5.00–6.00–6.50 7.00–8.00–9.00
WARWICK 1428 Locust St.	2.00–2.50–3.00	3.50–4.00–4.50 5.00	4.00–5.00–6.00
YORK 8 South 6th St.	2.00–2.50	3:50–4.00	4.50

INCIDENTS OF PRACTICE

DERMATITIS DUE TO PERMAFIX: CASE REPORT

By MICHAEL ZELLER, M.D., Chicago, Ill.

PERMAFIX is a dental preparation used to a considerable extent by dentists in sealing root-canal fillings to maintain sterility. It consists of dry and liquid materials which are mixed into a paste. This paste is then forced into the root canal under pressure of a gutta-percha point, and, after several hours, it becomes hardened and fixed. In view of the importance of various dental products in sensitization syndromes, the following case of dermatitis venenata of the hands of a dentist resulting from sensitization to the liquid portion of permafix is reported.

REPORT OF CASE

History.—H. B., aged 43, a dentist, seen in September 1936, complained of dermatitis involving the thumb and index and middle fingers of both hands. The patient stated that in November 1935, he noted an itching of the fingers of the right hand. A few weeks later, the fingers of the left hand began to itch, but not so severely as those of the right hand. The itching was shortly followed by redness, swelling and fissures, progressing to such an extent as to cause complete disability, except at short intervals. In December 1935, an infection developed in the fingers of the right hand, gradually involving the entire right arm. During three weeks of hospitalization for treatment of the infection, the dermatitis cleared up and the patient was discharged. On resumption of work in January 1936, itching, redness and fissures of the fingers reappeared with a recurrence of the acute dermatitis. The patient stated that on Sundays and during vacation periods, the symptoms were much lessened, and, on several occasions, there was complete healing. He has a son and a nephew who have ragweed hayfever.

Examination.—There were diffuse redness and numerous fissures with slightly oozing clear material involving the thumbs and index and middle fingers of both hands, particularly the right hand. The lesions involved the palmar surfaces more than the dorsal and the terminal phalanges more than the proximal. Urine analysis and blood counts were within normal limits. The blood Kahn and Wassermann tests were negative. Scratch and intradermal tests were negative to the usual common atopens. The distribution and the type of the lesions, as well as the patient's improvement when away from work, indicated a contact dermatitis. Accordingly, patch tests were made, including 2 per cent procaine, 10 per cent zinc chloride, 10 per cent oil of cloves, dental cements, a standard mercurochrome solution, iodoform powder and powdered and liquid permafix. The patch tests were negative, except for the liquid permafix, which developed itching within a few minutes, becoming increasingly severe, and continuing after the removal of the patch three hours later.

Outcome.—The affected area was erythematous and subsequently developed fissures, which persisted for two weeks and then healed. On the removal of the permafix liquid from the patient's office, the fingers healed within a week, but the dermatitis recurred immediately when permafix liquid was used again. Attempts to protect the fingers by wearing finger cots resulted in itching above the cots, and only by wearing rubber gloves was irritation prevented.

The Council on Dental Therapeutics has informed us that the proprietors of permafix are the authors of U.S. patent

1,601,301. According to this patent, the preferred formula of "a material for permanently sealing root canals of teeth" is as follows:

Ammoniated alum, 48 parts; aristol (dithymol iodide), 4 parts; magnesium oxide, 96 parts; thymol, 36 parts; zinc oxide, 168 parts, and sufficient cresol and formalin, in equal proportions, to give the desired consistency to the mixture.

In view of the suggested composition of the liquid given by the Council on Dental Therapeutics, patch tests were made with 5 per cent cresolated formaldehyde, N.F.V., 5 per cent orthocresol, and 5 per cent formaldehyde, but in no instances could a positive test be obtained. However, when whole liquid permafix was applied again, symptoms developed immediately, being due presumably to ingredients not given in the preferred formula of the patent specifications quoted above.

The patient had used permafix liquid for several years prior to the development of symptoms. Apparently, repeated contact with the product resulted in sensitization of the skin. The possibility of sensitization to permafix liquid should be considered in persons presenting dermatitis of the fingers and engaged in handling dental materials.

4753 Broadway.

Bilateral Fracture of the Maxillae: Report of a Case

By E. P. Cressler, Sr., D.D.S., and E. P. Cressler II, A.B., D.D.S., Newton, Kans.

History.—Mr. I. A., aged 49, was brought to the Axtell Christian Hospital, October 17, 1935, suffering from a complete bilateral fracture of the maxillae through the floors of the antrums of Highmore, and the base of the nose. The complete alveolar arch could be shifted bilaterally by pressing on either of the buccal surfaces.

The problem of placing both the teeth and the alveolar arches in correct occlusal alinement with the lower jaw was solved with a Kinsley splint and a mandibular jaw strap.

A wax bite was taken in order to record the occlusal relations of the jaws. Then the maxillary alveolar processes were shifted around until the teeth seemed to be in correct occlusal relationship with the mandibular teeth.

Now a bite impression was taken in compound, from which a Kinsley splint was made in vulcanite rubber. Bicycle spokes were embedded in the rubber to form the arms of the splint after vulcanization.

The splint was placed in the mouth in such a manner as to have the pressure from the mandible support the fractured maxillae. This, along with straps that were attached to the arms of the splint, helped to hold them in place. These straps passed up and over the head, being then embedded in a plaster and gauze head cast. The pressure from the mandible was aided by a strap from the head cast, which was passed under the lower jaw and back to the cast. Thus, it was strapped firmly to place in the splint, holding the correct occlusal relationship of both jaws.

The mouth was sprayed daily and the patient was kept on a complete liquid diet for two weeks.

The fear of meningitis was continually present, but the patient made an uneventful recovery. He was dismissed from the hospital and clinic November 13, 1935.

This was the first time that we have ever encountered a complete bilateral fracture of the maxillae and the senior author has practiced dentistry since 1902.

PRACTICE IN PARAGRAPHS

This department is intended for busy readers. It aims to tell a vivid story in a few words. Items should be of a practical character, and free from padding—not more than a paragraph or two. We exact no limit, but two hundred words can tell most of these stories. Send in your ideas; they will be welcome.

Proximal Class III Cavities.—When two Class III cavities approximate each other on adjacent teeth, it is advisable to prepare and fill these cavities at one sitting. Separation is accomplished and maintained with a mechanical separator. This separator, however, becomes an obstruction when the operator attempts to use a celluloid matrix and the silicate is inserted. This is because the arms of the separator extend in such manner as to interfere with the proper manipulation of the celluloid, thus preventing the operator from properly contouring the silicate filling. It, therefore, becomes necessary to alter the separator so that it will extend toward the opposite side. But, in the release of the separator to do this, a gush of blood is usually encountered from the interproximal space. This is most inconvenient in that the operator must wait for the flow of blood to cease before continuing work. Often, the blood will dry around the margins of the cavity and stain the silicate as well as leave a dark ring around the filling. In order to overcome this, the following is recommended: Before the separator is released, a wedge-shaped orangewood point is inserted at the contact point between the two teeth until it binds itself. The separator may now be released and changed around. The wood wedge will maintain the separation while the separator is being changed. No blood will emerge from the interproximal space and the above-mentioned difficulties will be avoided.—*H. Martin Berman, Floral Park, N. Y.*

Hint for the Ceramist.—I have found the use of cellophane in place of the conventional silk tape extremely valuable in the burnishing of platinum matrices for porcelain jacket crowns and inlays. After the platinum matrix has been adapted and is ready for burnishing and ironing out of wrinkles, the ceramist will find that cellophane in thicknesses of one and two layers will greatly facilitate burnishing. No matter how much pressure is used with either orangewood stick or metal burnisher over cellophane, the matrix will not tear, and the cellophane being transparent, the matrix is always in view of the porcelain worker.—*Harold O. Bakke, Minneapolis, Minn.*

Paregoric in Child Extractions—In extracting abscessed teeth for children, a dose of paregoric, dosage according to age, will work wonders in helping relieve pain and shock and relaxing the child to the extent that better anesthesia can be obtained.—*Claude A. Moore, Lexington, Miss.*

Reducing Silver Nitrate Solution—The best way to precipitate or reduce silver nitrate in a cavity or on an etched surface of a tooth is to apply fresh x-ray developing solution on a pledget of cotton after application of 50 per cent solution of silver nitrate.—*Rowe Smith, Texarkana, Texas.*

PACKAGE LIBRARIES*

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of the

AMERICAN DENTAL ASSOCIATION

212 East Superior Street, Chicago, Ill.

Actinomycosis of head and neck.
Adamantinoma.
Agranulocytic angina.
Alveolar process—its structure and resorption.
Alveolectomy.
Amalgam fillings and physical properties of amalgam.
Anesthesia—discovery and early uses.
Anesthetics in children's dentistry.
Angle's orthodontic appliances.
Apicoectomy.
Articulation, occlusion and mandibular movements.
Autogenous vaccines.
Avertin in oral surgery.
Bacteria of the mouth.
Bacteriologic studies of root canals.
Bacteriologic studies of vital pulps.
Biographies of dentists.
Blood examination in focal infection.
Bogue's articles from Dental Digest.
Bridges using inlays as abutments.
Broken needles.
Bureau of Standards reports.
Business side of dentistry.
Calcium metabolism.
Cancer of mouth.
Cast gold crowns.
Cast gold inlays.
Casting gold, including inlays and dentures.
Cavities—proximal.
Cavities with hypersensitive dentin—preparation of.
Cavity preparation.
Cementation of inlays.
Cements—uses and physical properties.
Centric occlusion.
Child psychology.
Children's dentistry.
Clasps—wire and cast.
Cleft lip and palate—etiology and surgical treatment.
Cleft palate—orthodontic treatment and prosthetic appliances.
Community and school dental service.
Comparative dental anatomy.
Conduction anesthesia.
Contributions dentists have made outside their profession.
Crime detection and dentistry—identification by means of teeth.
Curetting.
Cysts and tumors of mouth.
Deafness caused by retrusion of mandible. (See Retrusion of mandible, etc.)
Deciduous teeth as foci of infection.
Dental assistants.
Dental care of the preschool child.
Dental caries.
Dental caries—bacteriologic and chemical theories regarding.
Dental caries, etiology and control.
Dental clinics.
Dental disease and practice in the tropics.
Dental economics.
Dental education.
Dental health education.
Dental hygienist in the hospital.
Dental hygienists.
Dental libraries.
Dental materia medica and therapeutics.
Dental metallurgy.
Dental nomenclature.
Dental service in the World War.
Dental technicians.
Dentifrices.

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Dental students who are junior members may borrow material under the same regulations as regular members. As the Library facilities are limited, dental students other than junior members cannot be accommodated.

Dentin—its permeability, resorption, etc.
Dentistry as a career and the status of the dentist.
Dentistry in foreign lands.
Dentistry in U. S. Army and Navy.
Dentistry of the time of George Washington.
Denture bases—discussion of materials.
Denture casting.
Denture patients—education of.
Diabetes and dentistry.
Diathermy and surgical diathermy in dentistry.
Diet and nutrition in relation to teeth.
Diet in pregnancy.
Diet in relation to periodontal disease.
Dry socket.
Electro-deposition of metals for dental purposes.
Electrogalvanic lesions.
Embryology—dental.
Emphysema.
Enamel and dentin—anomalies of.
Enamel—permeability, staining, composition, etc.
Endocrine glands in relation to teeth.
Epithelial débris.
Erosion and abrasion of the teeth.
Eruption of teeth—dates of eruption and accompanying symptoms.
Eruption of teeth—theories regarding.
Esthetics in denture construction.
Ethics—dental.
Ethyl chloride.
Ethylene anesthesia.
Evipal in oral surgery.
Evolution of human dentition.
Examination of the mouth and oral diagnosis.
Exodontia for the general practitioner.
Extraction of teeth.
Face-bow technic and recording of occlusion.
Facial prosthesis.
Fauchard's (Pierre) life.
Fixed and removable bridgework.
Fixed bridgework.
Focal infection.
Focal infection and arthritis.
Focal infection and oral sepsis in relation to gastro-intestinal disturbances.
Focal infection in relation to diseases of the eye.
Foreign bodies (of dental origin) in the lungs and esophagus.
Fractures of the jaws.
Full-denture construction.
Gagging.
Gold-foil.
Granulomas and granulomatous areas.
Growth and development of teeth and jaws.
Growth of the mandible.
Halitosis.
Hartman's solution.
Hawley's articles.
Heat and cold therapy as indicated in dentistry.
Hemophilia or excessive hemorrhage following extraction.
Histologic examination of fractured roots.
Histologic study of teeth and tissues.
Histology of peridental membrane.
History and evolution of gold crowns and inlays.
History and progress of dentistry.
History of dental ceramics.
History of dental education in U. S.
History of dentistry.
History of full denture construction.
History of the toothbrush.
Hospital dental service.
Hospital internships for dentists.
Hutchinson's teeth and effects of febrile diseases on unerupted teeth.
Hypercementosis and excementosis.
Hypnotism.
Identical twins.
Immediate denture service.
Impacted teeth and their removal.
Impacted third molars.
Impacted teeth and their relation to various physical disturbances.
Impacted upper cuspids.
Implantation, replantation, transplantation of teeth.
Impression materials and technic.
Impression materials—colloidal.
Impression taking for cast gold inlays.
Impression technic.
Incidence of dental defects.
Indirect inlay technic.
Industrial dental service.
Infection following extraction of teeth.
Influence of deciduous teeth and first permanent molars on occlusion.
Influence of dental improvements on appearance and mental conditions.
Influence of diet on saliva.
Innervation of teeth.
Interpretation of roentgenograms.
Investment compounds and technic.
Ionic medication.
Jackson's (V. H.) articles on orthodontic appliances.
Jurisprudence and malpractice.
Labial frenum.
Lesions of the mouth.
Leukemia.
Leukoplakia.
Local anesthesia.
Local anesthesia—contraindications and untoward results.
Lower denture construction.
Ludwig's angina.

Malocclusion—etiology of and preventive orthodontia.
Malocclusion—habits as factors in.
Malocclusion—hereditary influences in.
Masks and casts.
Materia medica and pharmacology.
Matrix.
Maxillary sinus and antrum—diseases and treatment.
Milk—vitamin D, certified, pasteurized, etc.
Monson's theory.
Mottled enamel.
Mouth hygiene.
Nitrous oxide-oxygen analgesia.
Nitrous oxide-oxygen anesthesia.
Nitrous oxide-oxygen anesthesia and carbon dioxide.
Nupercaine.
Nurses—suggestions for lectures to.
Occlusion in partial dentures.
Occlusion in relation to operative dentistry.
Opening the bite.
Oral diagnosis with reference to roentgen rays.
Oral manifestations of metallic and drug poisoning.
Oral manifestations of systemic conditions.
Organized dentistry.
Orthodontia and its relation to dentistry and medicine.
Orthodontia—biologic phases of.
Orthodontia for the general practitioner.
Orthodontia—muscle exercises and training in.
Orthodontic anchor bands.
Orthodontic appliances.
Orthodontic diagnosis and measurements.
Orthodontic diagnosis by gnathostatic methods.
Orthodontic treatment—best time for.
Orthodontic treatment of impacted cuspids.
Orthodontic treatment—place of extraction in.
Orthodontic treatment—relation of third molar to.
Osteitis deformans (Paget's disease), osteitis fibrosa (von Recklinhausen's disease) and leontiasis ossia.
Osteomyelitis of the jaws.
"Panel" or insurance dentistry.
Partial dentures.
Phonetics and speech defects.
Photography in dentistry.
Pinledge and pinlay attachments.
Plastic surgery.
Pollia's articles on radiology.
Porcelain in dentistry.
Porcelain inlays.
Porcelain jacket crowns.
Postoperative complications and care.
Postoperative psychosis.
Pregnancy and dental disease.
Preoperative examination of patients.
Preventive dentistry.
Preventive orthodontia.
Procaine (novocain) dermatitis.
Program building for state and district societies.
Prophylactic odontotomy.
Pulp amputation and mummification.
Pulp conservation including pulp capping and cavity lining.
Pulp pathology.
Pulp stones.
Pyorrhea.
Pyorrhea—early recognition and treatment.
Pyorrhea—etiology and relation to systemic conditions.
Pyorrhea—history and development of treatment of.
Pyorrhea—surgical treatment of.
Rebasing dentures.
Referred pain.
Relation between dental conditions and the mental health of insane.
Relation of the dentist to the physician.
Removable bridgework.
Removable bridgework—discussing various types of attachments.
Research Commission reports.
Resorption of roots and bone.
Restoration of oral functions including opening the bite.
Retainers used in orthodontia.
Retention of deciduous teeth and delayed eruption of permanent teeth.
Retrusion of the mandible causing impaired hearing.
Roofless dentures.
Root canals and pulp chambers—anatomy of.
Root-canal treatment.
Root-canal treatment in deciduous teeth.
Saliva—abnormal secretion of.
Saliva—various studies of or pertaining to.
Salivary calculus.
Salivary glands.
Shock, syncope and collapse.
Should dentistry be advertised?
Silicate cements (see cements—uses and physical properties).
Silver nitrate.
Social and economic phases of dentistry and other health services.
Soldering.
Space retention—its importance and methods of accomplishing.
Staining porcelain teeth.
Stainless steel and chrome alloys.
Stainless steel for orthodontic appliances.
Status of dentistry in our social and economic system.
Sterilization of dental instruments.
Stomatologic program (A.S.S.)
Stomatology—general discussions of.
Stories and rhymes for children.

Suggestions for talks to mothers.
Suggestions for talks to students.
Syphilis in relation to dentistry.
Teeth—composition and chemical analysis of.
Teeth—congenitally missing.
Teeth—supernumerary.
Teeth—mutilation and adornment of.
Temporomandibular joint.
Three-quarter crowns.
Thumb-sucking.
Tongue—diseases of.
Tooth forms and arrangement for full dentures.
Tooth structures—permeability of.
Toothbrushes and toothbrushing technic.
Toothbrushes, toothpastes and mouthwashes.
Torus palatinus.
Transplantation of teeth (see implantation of teeth).
Traumatic occlusion.
Trigeminal neuralgia.
Trismus and ankylosis.
Tuberculosis and dentistry.
Ultraviolet-ray therapy in dentistry.
Undergraduate and graduate orthodontic education.
Use of elevators in extraction.
Value of dental service in schools.
Value of roentgen-ray examination in orthodontia.
Vincent's infection.
Vulcanite and vulcanite stomatitis.
Waxes and wax expansion method.
Willett's articles.

IDENTIFICATION SOUGHT

THE accompanying illustrations show dental bridgework found in the mouth of an unidentified dead man whose body was discovered July 25, 1938, one-quarter mile south of County Trunk "D," directly back of the German Settlement Church, Township of Spring Prairie, Walworth County, Wis., on the property of John Meyers. (Photographs taken August 2.)

Description: Age, between 38 and 50; weight, approximately 170 pounds; height, 5 feet 8½ inches; hair, blond; left leg 1½ inches shorter than right because of fracture between knee and hip; left heel built up one-quarter inch higher than right; size of shoe, about 8; upper right part of mouth had removable bridge (Akers style) from midline to lateral incisor and first and second biscuspids.

Clothing: White "Manhattan" brand polo shirt; dark trousers with black stripe; black oxfords, about size 8; black silk socks with red pin stripe and clock.

Forward any information to Joseph A. Dorr, Sheriff of Walworth Co., Elkhorn, Wis.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

American Dental Association, St. Louis, Mo., October 24-28.

American Academy of Restorative Dentistry, St. Louis, Mo., October 22-23.

American College of Dentists, St. Louis, Mo., October 23.

American Society for the Advancement of General Anesthesia in Dentistry, New York City, fourth Monday in March and October.

American Society of Oral Surgeons and Exodontists, St. Louis, Mo., October 21-22.

American Association of Dental Editors, St. Louis, Mo., October 21.

American Association of Public Health Dentists, St. Louis, Mo., October 23-24.

American Society for the Promotion of Dentistry for Children, St. Louis, Mo., October 24.

American Academy of Periodontology, St. Louis, Mo., October 20-22.

American Full Denture Society, St. Louis, Mo., October 22-23.

Association of American Women Dentists, St. Louis, Mo., October 24-28.

Great Lakes Association of Orthodontists, Cleveland, Ohio, November 7-8.

Greater New York Dental Meeting, New York City, December 5-9.

National Board of Dental Examiners, December 2-3.

North Atlantic Orthodontic Society, New York City, November 18.

Allied Dental Council, New York City, November 2-5.

Chicago Dental Society, February 13-16, 1939.

Greater Philadelphia Annual Meeting, February 1-3, 1939.

District of Columbia Dental Society, second and fourth Tuesdays in each month from October to June, at the United States Public Health Service Auditorium, Washington.

Pan American Odontological Association, St. Louis, Mo., October 24.

Marquette University Dental Alumni Association, Milwaukee, Wis., November 11-12.

Montreal Dental Club Clinic at Montreal, Canada, October 12-14.

American Dental Hygienists' Association, St. Louis, Mo., October 24-28.

American Dental Assistants Association, St. Louis, Mo., October 24-28.

STATE SOCIETIES

November

Florida, at Jacksonville (10-12)

Ohio, at Cleveland (24-30)

February

Minnesota, at Minneapolis (21-23)

STATE BOARDS OF DENTAL EXAMINERS

California, at San Francisco, December 5. Kenneth I. Nesbitt, 515 Van Ness Ave., San Francisco, Secretary.

Connecticut, at Hartford, November 29-December 3. Almond J. Cutting, Southington, Recorder.

Indiana, at Indianapolis, November 14. J. M. Hale, Mt. Vernon, Secretary.

Louisiana, at New Orleans, December 14-17. Joseph L. Webre, 740 Audubon Bldg., New Orleans, Secretary.

New Jersey, December 5-10. Walter A. Wilson, 148 W. State St., Trenton, Secretary.

Ohio, at Columbus, October 24. Morton H. Jones, 1553½ N. Fourth St., Columbus, Secretary.

Texas, at Dallas, November 14-17. B. Carl Holder, 1009 Nixon Bldg., Corpus Christi, Secretary.

Wisconsin, at Milwaukee, December 12-16. S. F. Donovan, Tomah, Secretary.

MEMORIAL SERVICE FOR DR. JOHNSON

Memorial services for the late Dr. C. N. Johnson will be held in the Gold Room of the Hotel Jefferson, St. Louis, October 25 at 1 p.m., under the auspices of the Amer-

ican Association of Dental Editors in cooperation with the American Dental Association.

AMERICAN ASSOCIATION OF DENTAL EDITORS

The American Association of Dental Editors will hold its annual meeting in the Statler Hotel, St. Louis, October 21. Morning, afternoon and evening sessions will be held.

O. W. BRANDHORST, *Secretary*
4500 Olive Bldg.,
St. Louis, Mo.

AMERICAN COLLEGE OF DENTISTS

The American College of Dentists will hold its annual meeting in the Hotel Statler, St. Louis, October 23. An all-day meeting is planned, with the theme "Public Relations." Fellows are urged to attend all sessions to familiarize themselves with the work that is being done by the numerous committees.

O. W. BRANDHORST, *Secretary,*
4500 Olive St.,
St. Louis, Mo.

MINNESOTA STATE DENTAL ASSOCIATION

The Fifty-Sixth Annual Session of the Minnesota State Dental Association will be held in the Municipal Auditorium, Minneapolis, February 21-23, 1939.

L. M. CRUTTENDEN, *Secretary,*
481 Lowry Medical Arts Bldg.,
St. Paul.

OHIO STATE DENTAL SOCIETY

The Seventy-Third Annual Meeting of the Ohio State Dental Society will be held at the Hotel Statler, Cleveland, November 28-30.

HENRY STEUER, *Chairman of Publicity,*
Rose Bldg.,
Cleveland.

STATE OF CALIFORNIA BOARD OF DENTAL EXAMINERS

The next examination of the Board of Dental Examiners of California for license to practice dental hygiene in California will be held in San Francisco commencing December 5 at 9 a. m., at the Physicians & Surgeons College of Dentistry. Credentials must be filed in the office of the Secretary not later than twenty days prior to the examination.

KENNETH I. NESBITT, *Secretary,*
515 Van Ness Ave.,
San Francisco.

CONNECTICUT DENTAL COMMISSION

The Connecticut Dental Commission will meet in Hartford, November 29-December 3, for the examination of applicants for license to practice dentistry and dental hygiene and to transact any other business proper to come before it. Applications should be in the hands of the recorder at least ten days before the meeting. For application and further information, apply to

ALMOND J. CUTTING, *Recorder,*
Southington.

OHIO STATE DENTAL BOARD

The October examination of the Ohio State Dental Board will be held at the College of Dentistry, Ohio State University, Columbus, the week beginning October 24. All applications must be in the hands of the secretary at least ten days before the date of the examination. For further information, apply to

MORTON H. JONES, *Secretary,*
1553½ North Fourth St.,
Columbus.

MINNESOTA STATE BOARD OF DENTAL EXAMINERS

The next examination of the Minnesota State Board of Dental Examiners will be held at the School of Dentistry, University of Minnesota, Minneapolis, December 9-15, for the granting of licenses to practice dentistry and dental hygiene in the state. All applications must be in the hands of the secretary at least ten days previous to the opening of the examination. Address all communications regarding particulars to

PAUL HAGEN, *Secretary,*
Crookston.

AMERICAN FULL DENTURE SOCIETY

The American Full Denfure Society will meet in St. Louis at the Jefferson Hotel, October 22-23.

H. L. HARRIS, *Secretary,*
Lowry Medical Arts Bldg.,
St. Paul, Minn.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

The next meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held at the Belmont Plaza Hotel, New York City, October 24. Albert S. Hyman, M.D., New York City, will speak on "Cardiac Stress During Anesthesia; Some Aids in Handling Collapse."

HARRY J. FIELD, *Secretary,*
130 Market St.,
Newark, N. J.

NORTH ATLANTIC ORTHODONTIC SOCIETY

The Ninth Semiannual Meeting of the North Atlantic Orthodontic Society will be held November 16 at the Hotel Pennsylvania, New York City.

MALCOLM MEISTRELL, *Secretary,*
136 E. 57th St.,
New York City.

THE ALLIED DENTAL COUNCIL

To celebrate the twenty-fifth anniversary of the Allied Dental Council, a four-day meeting has been arranged for November 2-5 at the Hotel McAlpin, New York City. November 2, a symposium on "Twenty-Five Years of Dental Progress" will be given, with William J. Gies speaking on the educational phases, John Oppie McCall on the scientific and Simon Shapiro on the organizational. November 3, a symposium on "Dentistry Facing Its Future" will be presented by Herman A. Gray, giving the social and legislative trends, J. A. Salzmann, giving the dentist's status, and Robert F. Wagner, speaking on the public angle. November 4 will be given over to clinics and round table discussion and an art and hobby exhibit, and November 5 (evening) a banquet and dance will be given. All ethical practitioners are invited to attend and participate in this meeting.

CHICAGO DENTAL SOCIETY 1939 MIDWINTER MEETING

The Midwinter Meeting of the Chicago Dental Society will be held February 13-16 at the Stevens Hotel. In 1938, the Midwinter Meeting achieved new records in attendance with more than 10,000 visitors registered during the five days. Greatly enlarged commercial and scientific exhibits were also features that will be continued for the 1939 meeting.

COUNCIL ON DENTAL EDUCATION

The newly organized Council on Dental Education of the American Dental Association, successor to the "Dental Educational Council of America," is preparing policies and plans of procedure to meet with the changing conditions in dental education. It is to act specifically as an agency for accrediting the course of study in the dental schools of the country and generally to promote the interests of dental education.

As soon as plans of procedure, which are now being considered, are formulated and adopted, the Council will proceed to examine the course of study of the schools of the United States with a view to reclassifying them.

ARTHUR C. WHERRY, *Chairman*
LEROY M. S. MINER, *Vice-Chairman*
M. WEBSTER PRINCE
JOHN T. O'ROURKE
ROBERT L. SPRAU
WILLIAM F. BELL
WALTER M. MORGAN
J. BEN ROBINSON
MINOR J. TERRY, *Secretary Pro Tem.*

NATIONAL BOARD OF DENTAL EXAMINERS

The National Board of Dental Examiners will hold a meeting for the examination of candidates in Parts I and II, December 2-3, in cities where five or more candidates present themselves for examination. For information and application blanks, address

MORTON J. LOEB, *Secretary,*
66 Trumbull St.,
New Haven, Conn.

LOUISIANA STATE BOARD OF DENTISTRY

The next examination of the Louisiana State Board of Dentistry for license to practice dentistry and dental hygiene will be held in New Orleans, December 14-17, at Loyola University. All credentials must be in the office of the secretary at least twenty days prior to the examination. Address all communications to

JOSEPH L. WEBRE, *Secretary,*
740 Audubon Bldg.,
New Orleans, La.

MEETING OF THE ORAL HEALTH GROUP OF THE AMERICAN PUBLIC HEALTH ASSOCIATION

The American Public Health Association, through its oral health group, announces sessions of special interest to dentists to be held on Friday, October 28, at the annual meeting of the association in Kansas City, Mo.

The program has been planned so that dentists wishing to attend will have to miss only a part of the clinic program of the American Dental Association. Kansas City is six hours by train from St. Louis. Dentists will find points of interest in various section meetings Friday morning, especially the Section on Public Health Education. At 12:30, at the Hotel Kansas Citian, the oral health group will hold a luncheon. Henry F. Vaughan, D.P.H., health commissioner of Detroit, Mich., will be the speaker. There will be a short business meeting. All dentists, dental hygienists and others interested will be welcome. At 2:00 the sections on child hygiene and public health education will hold a joint session in conjunction with the oral health group on the topic "How to Improve Dental Conditions in the United States." This will be conducted as a panel with Don W. Gudakunst, M.D., health commissioner of the State of Michigan, as leader and coordinator. Other speakers will be Guy S. Millberry, D.D.S., dean of the College of Dentistry, University of California, San Francisco; C. E. Turner, D.P.H., Sc.D., professor of biology and public health, Massachusetts Institute of Technology, Cambridge; J. F. Owen, director of the Bureau of Dental Health, Lexington, Ky.; Frank C. Cady, U. S. Public Health Service, Washington, D. C. All who are interested will be welcome.

A registration fee of $2 is required of both members and non-members attending the meetings of the association throughout the week. This fee is suspended on Friday, but must be paid by those who wish to secure a copy of the official program.

JOHN OPPIE MCCALL, *Chairman*,
Oral Health Group,
422 E. Seventy-Second St.,
New York City.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING JULY AND AUGUST 1938

July 5

No. 20,781, to JAY A. HEIDBRINK. Gas administering machine.

No. 2,122,619, to JOHN F. MCMATH. Dental instrument.

No. 2,122,920, to ARTHUR N. RUSSELL. Dental stick.

July 12

No. 2,123,334, to MAX HAUSMANN. Inhaling apparatus.

No. 2,123,407, to WALTER A. DULLEA. Toothbrush.

July 19

No. 2,124,145, to JOHN MERKEL. Motor driven rotary toothbrush.

No. 110,570, to LOU DUNLAP LAIRD. Design for a dental plate brush or similar device.

July 26

No. 2,124,647, to GEORGE A. BAULER. Toothbrush.

No. 2,124,831, to WALTHER ROOS. Method of and device for cooling dental tools, such as drills or the like.

No. 2,124,971, to HARRY EISENBERG and ANTHONY J. ZOLENAS. Liquid dentifrice.

August 2

No. 2,125,587, to ANNIE RICHARDSON. Orthodontic bracket.

No. 2,125,809, to JOHN BAIRD PUCKETT. Dental device.

August 9

No. 2,125,980, to STEPHEN THEODORE BASIL. Dental instrument.

No. 2,126,463, to FREDERICK E. GUNTRIP. Anesthetic.

August 16

No. 2,127,285, to FREDERICH L. BRECHT. Dental bridge lock.

No. 2,127,365, to WILLIAM O. MCHUGH. Package of dental x-ray films.

August 23

No. 2,127,502, to ANDRE DE WEAL. Dental film holder.

No. 2,127,932, to JOSEPH PELLKOFER. Sterilizing apparatus for surgical and dental appliances and the like.

August 30

No. 2,128,254, to CLIFFORD S. KILE. Liquid ejecting device.

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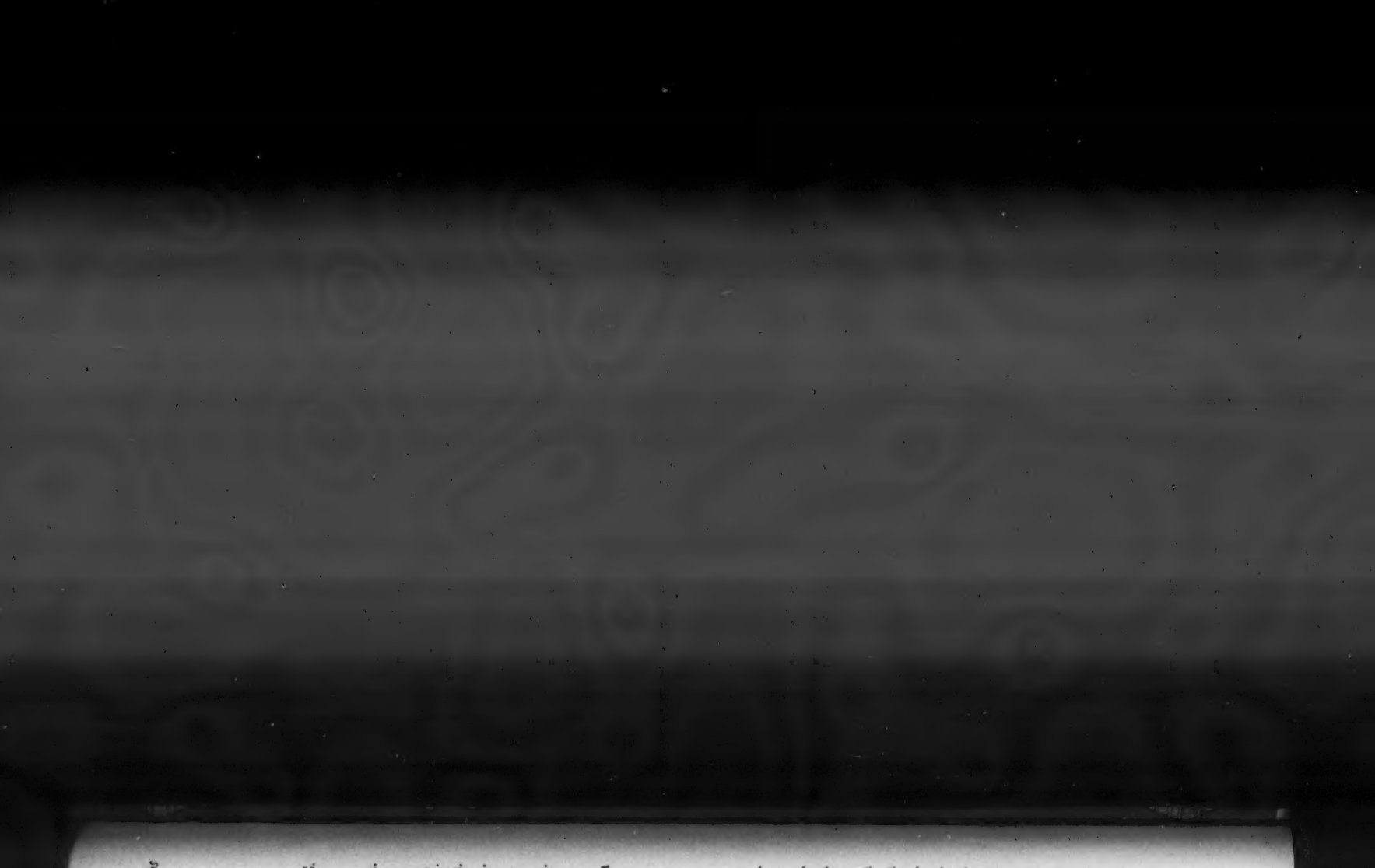
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